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AND SHIPBUILDING & MARINE ENGINEERING NEWS

VOL. CXXV No. 3049 WEDNESDAY, DECEMBER 5, 1951 Price 1/6

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Canadian Pacific's Atlantic service came into being in 1903, with sailings between Canada, Britain and the Continent. Absorption of the Allan Line and the purchase of new tonnage greatly increased the size of the C.P. fleet in the inter-war years. Their best known vessel in those times was the *Empress of Britain*, famous for her annual world cruises.

At present the Canadian Pacific fleet consists of eleven vessels. Three passenger ships, *Empress of Scotland*, *Empress of Canada*, and *Empress of France* provide a weekly service between Europe and Canada. Of seven "Beaver" ships, three are passenger/cargo vessels ; the other four are devoted entirely to cargo work. *Empress of Australia* is engaged on trooping.

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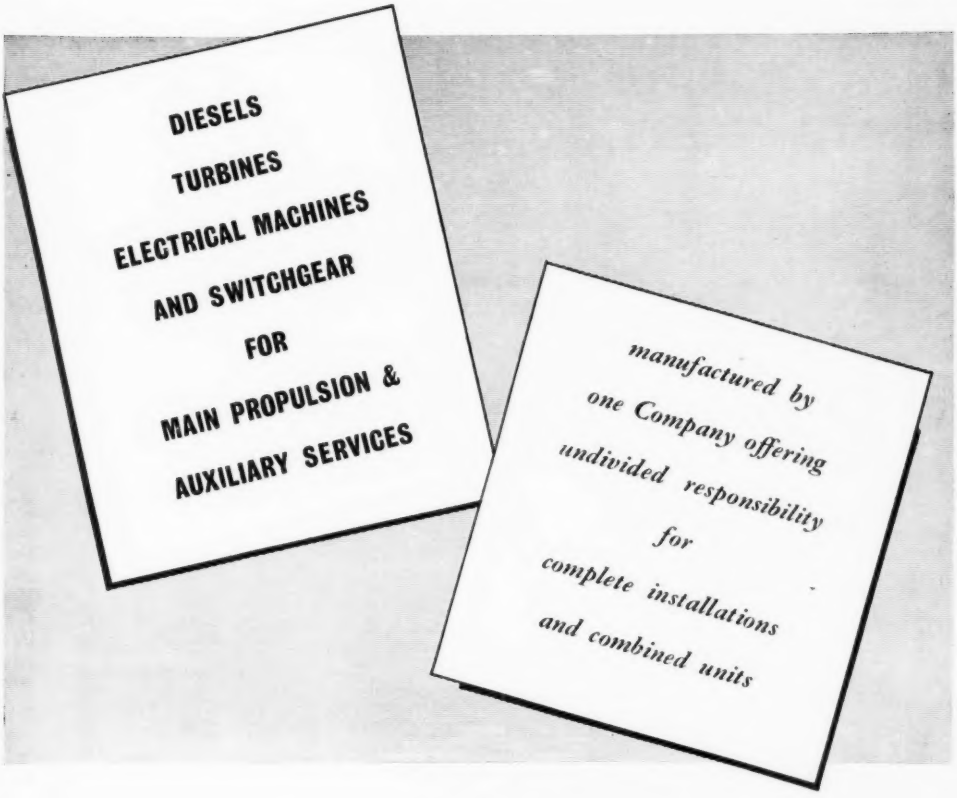

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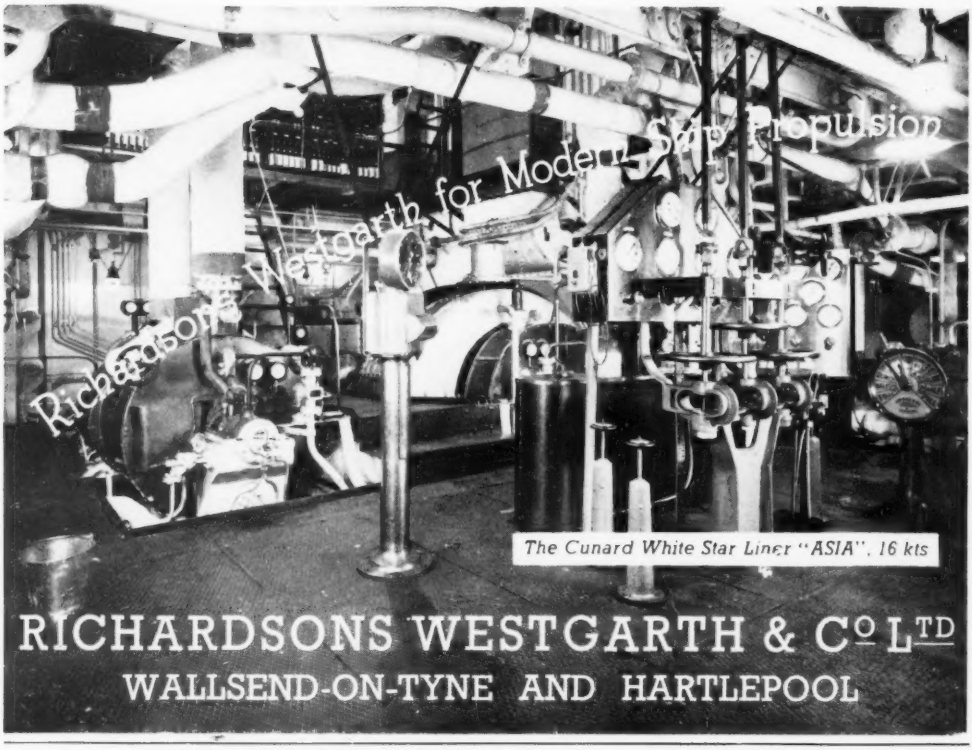

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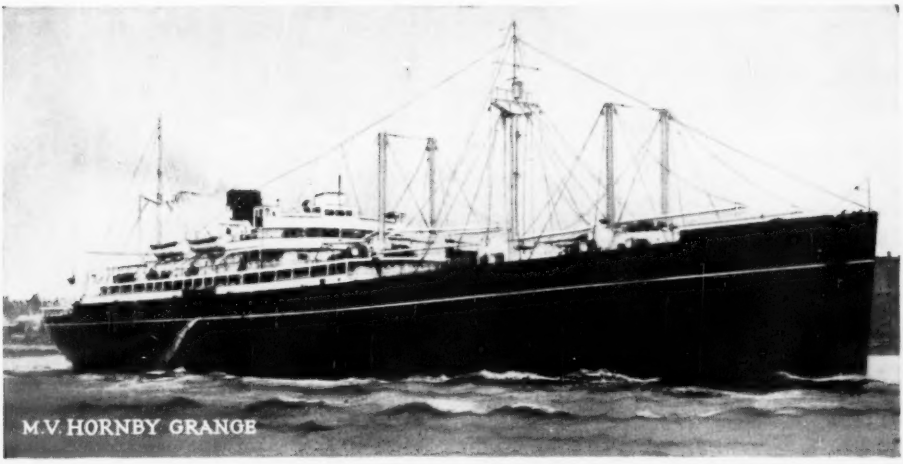
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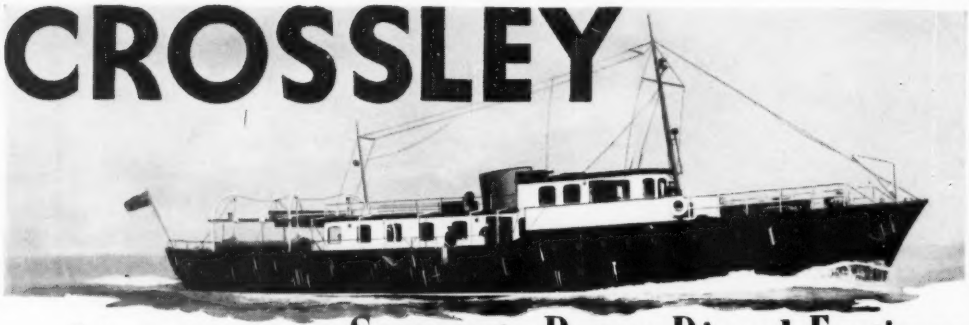

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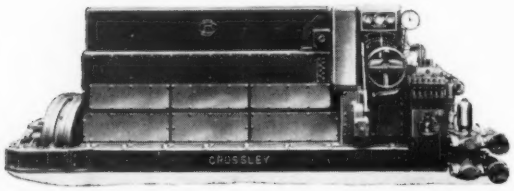

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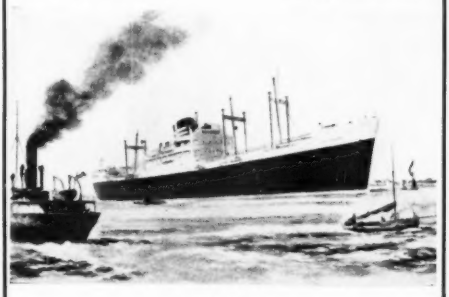

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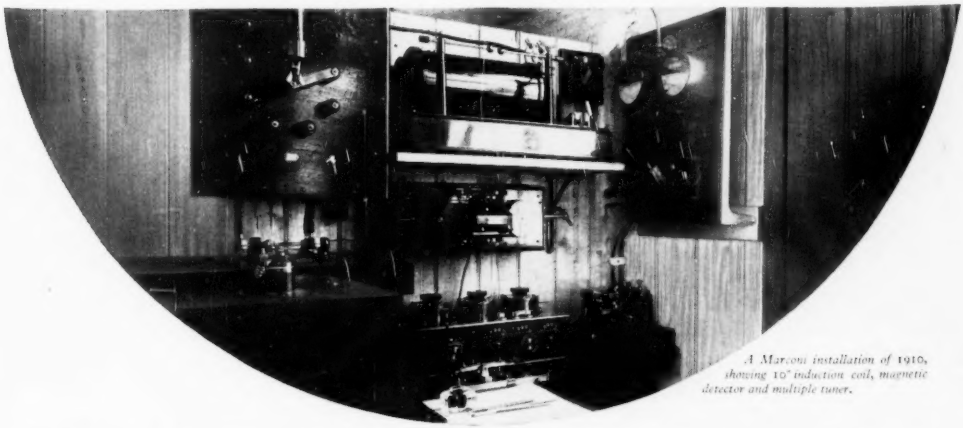

A Marconi installation of 1910, showing 10" induction coil, magnetic detector and multiple tuner.

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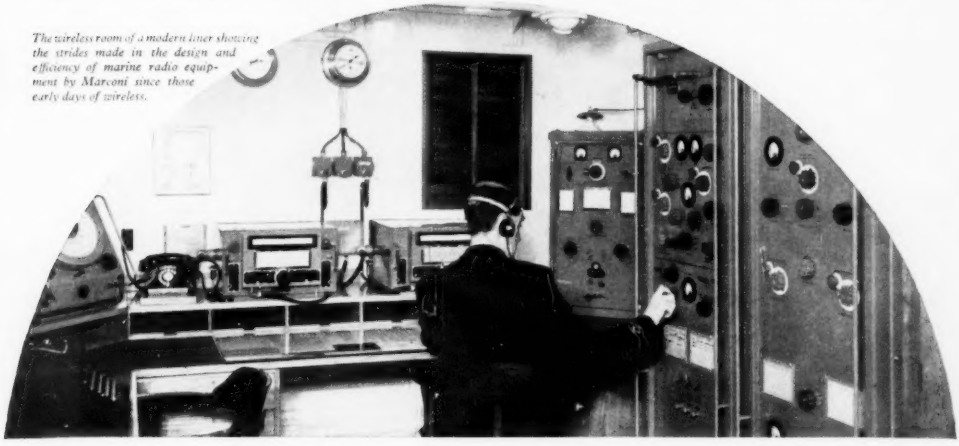

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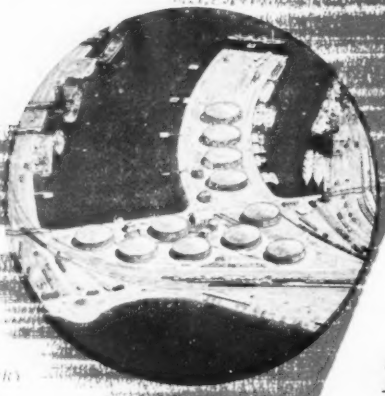

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Editor :—PETER DUFF *Managing Editor* :—RONALD KENDALL, M.C.M.S., A.M.I.N.A *Advertisement Manager* :—M. B. FIELD

Annual Subscription 70s.

Head Offices : 1, Arundel Street, London, W.C.2. (Temple Bar 2523) *Telegrams* : "Shipping World," London

Northern District Manager : W. S. Wilson, M.I.E.E., 27 Exchange Buildings, Newcastle-on-Tyne. *Telephone* : Newcastle 27078

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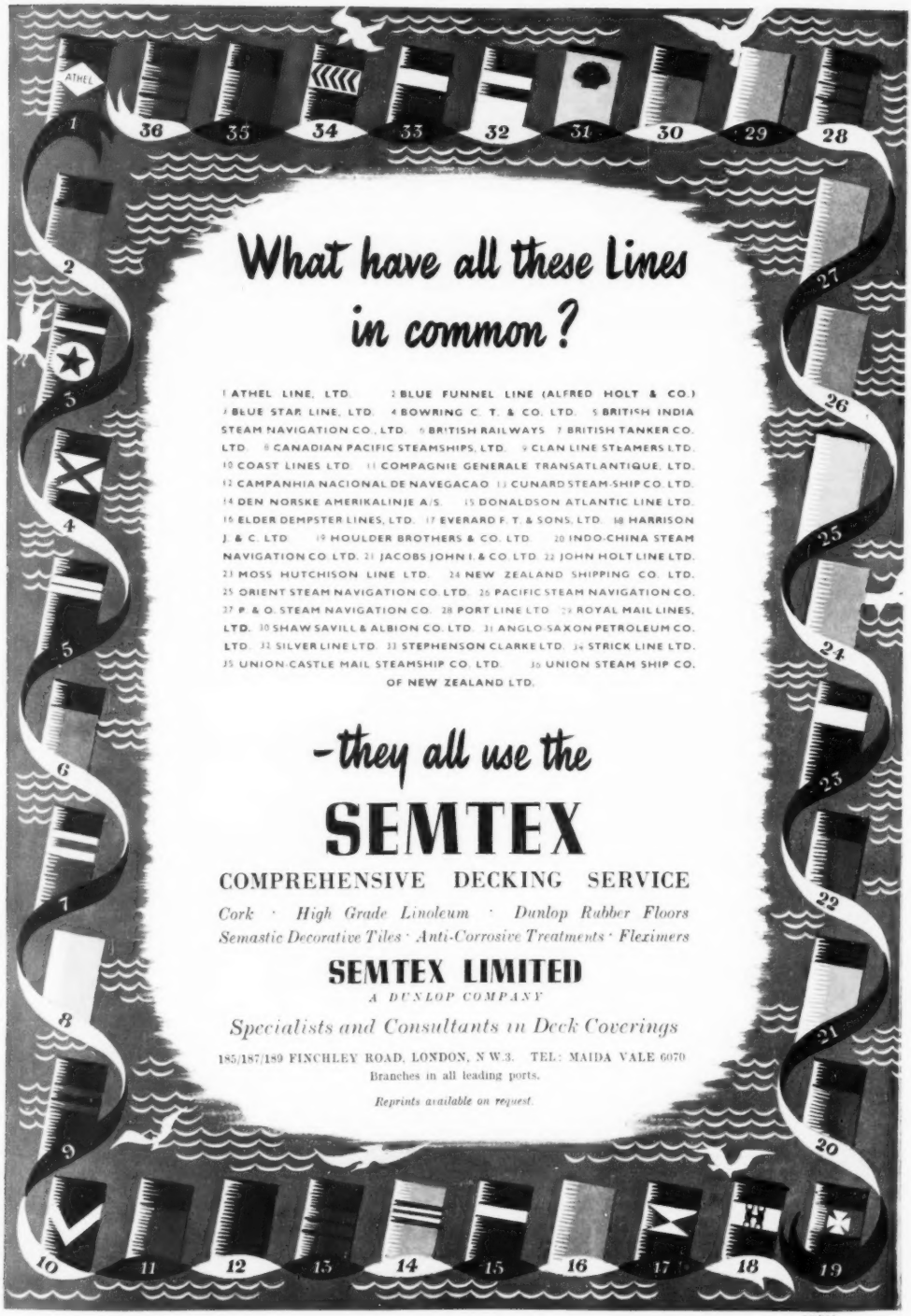

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BRITISH TAXATION AND PERSIAN OIL

THE STATEMENT of Sir William Fraser, which accompanies the accounts of the Anglo-Iranian Oil Co., Ltd., is a historic document. It is notable, first, since it gives for the first time details of the offers made by the company to the Persian Government in recent years, and thus Sir William has refuted, once and for all, the allegations that have been made in propaganda against the company. Secondly, he has shown how rapidly, and with what remarkable success, the company has consolidated its resources and overcome the deficiencies arising from the drying up of supplies of oil and refined products from Iran.

In its offers to the Iranian Government of revised concessionary terms, the company has been prompt and generous, both absolutely and in comparison with other oil companies operating in the Middle East and elsewhere. Revision of the terms of the 1933 Convention were offered by the company on the basis of a fifty-fifty sharing of profits from its Iranian operations in 1948 and again in 1951, but both were rejected by the Iranian Government. The Government did accept, however, the Supplemental Agreement of 1949, a formula based on a tonnage royalty on Iranian oil, plus a sum equivalent to 20 per cent of the amount of the company's profits from its worldwide activities allocated to ordinary dividend or general reserve. This formula, it is calculated, would have given Iran about £50,000,000 for 1951, if there had been no interruption in the company's operations. It should be noted, however, that the largest financial beneficiary last year was neither the Iranian Government nor the Anglo-Iranian Company, but the British Treasury, which took more than £50,000,000 out of the group's trading profit of £81,000,000. In comparison with the tax collector's share, the sum of just over £7,000,000 paid in dividends is trivial. In a leading article, *The Times* has pointed out that this fact played a direct part in the dispute between the company and the Iranian Government, since the 1933 Convention contained a profit-sharing clause based on the amount of profits distributed to ordinary shareholders, not on the total profits. "It was, therefore, the policy of dividend restraint which caused the company in 1948 to approach the Persian Government with the offer of a new agreement." American oil companies, it is pointed out, in their fifty-fifty profit-sharing agreements with other Middle East countries, are allowed by the United States tax authorities to offset such payments against federal taxation, but British companies, clearly, would not get such generous treatment from the British Treasury. As *The Times* claims, "if this country is to play its proper and indispensable part in economic development overseas, fiscal and foreign policies must come more closely into line."

Fortunately the Anglo-Iranian Company, despite its substantial interests in Iran, does not keep all its eggs in one basket, and it is remarkable how quickly it has been able, with foresight and courage, to adjust its affairs to the new situation. As Sir William has emphasised, the company now has at its disposal crude oil production at the rate of about 20,000,000 tons a year from its interests in Kuwait, Iraq, Qatar and the United Kingdom, almost double what was obtained from these sources in 1950. As regards refining capacity, additions now in hand, including the Kent refinery, should increase the total to over 20,000,000 tons by the end of next year. Nor must the company's other large interests be forgotten. The huge fleet of the British Tanker Co., Ltd., is fully and profitably employed. It is some measure of the resilience of the company's organisation that over 90 per cent of the group's tanker fleet was trading again within one month of the date when tankers ceased to call at Abadan and Bandar Mashur. Finally, there is the large Anglo-Iranian network of distribution and sales organisations. Expansion in the provision of fuel and diesel oil for ships' bunkers has been continuous, and the company's international bunkering organisation operates at some 150 of the world's ports. It is clear that, despite the temporary disruption in the operations of the company caused by the Persian dispute, it is the Persians, in their blind and ignorant folly, who will eventually be the only losers, unless they can be persuaded, by economic arguments if by no other, to adopt a more reasonably attitude to their greatest benefactors.

Current Events

The Cost of the Welfare State

THE HONEYMOON of the Welfare State has come to an end, and now we have to settle down to paying the bills; unfortunately, money, which has been cheap, is getting dearer, "Daltons", of nominally £100, now standing only at about £60. There are few countries in the world in which this expensive social experiment could have been tried with greater risk of failure. We live in an overcrowded island and have to pay for half our food and practically all our raw materials by exports, visible and invisible, which must be sold in world markets which are highly competitive. Though it should be obvious that wages largely control prices and that the bigger the pay packets the less the spending value of their contents, wages are still rising; it is estimated that the nation's wage bill in the next twelve months may be higher by £500,000,000 though the hours of labour remain smaller than in any other country in Europe, including Germany, and, of course, much lower than in Japan. Germany and

Japan will be our two keenest competitors in future. Rising wages, in association with the rising cost of raw materials, including coal as well as transport by rail, road or canal, will result in higher living costs; the "paper money" which each worker will receive in future months will buy less. That means more inflation. The misrepresentation that the cure is lower profits and the limitation of dividends has been exposed. It served its purpose in deluding the ignorant electors, just as the outcry against "The City" has been countered by proof that without the financial transactions carried on by the Stock Exchange in London and other cities, by financiers generally, the business connected with sea transport and insurance institutions, we could never have become as prosperous as we were before the Kaiser Wilhelm began his campaign against this country, boasting that, though he might not win the war which he began, he would start a movement which would ruin this country. Hitler then came on the scene. Though he also lost his war, he impoverished us to an extent which the average man and woman in these islands did not appreciate. And now the Communist dictators behind the Iron Curtain, with their satellites in this country, hope to complete the job. Communism can succeed only if capitalist countries are brought to ruin.

Harder Work the Cure

THERE has been much talk of more "productivity." That is a euphemism which means harder work. How many of the candidates at the General Election had the courage to utter those two words? But now that the electors have cast their votes, Mr. Alfred Robens, the late Minister of Labour, has spoken out boldly. It may be hoped that his remarks will be read in every shipyard, engine shop and factory. He stated that if, instead of concentrating every effort on raising wage rates, all the workers, including, of course, those who work with their brains, would bring themselves to think in terms of lowering wage costs by producing more goods, the country would have gone a long way toward finding the solution of the problem that besets everyone—the problem of rising prices. He declared that the future of this country depends on greater productivity, in other words harder work, which is, of course, a sober fact. "It is the key that will provide the restoration of the financial and economic stability of the country, the strengthening of its self-defensive power against any military aggression, the maintenance of unique social services, the steadying of prices and the preservation of our standards of living." Mr. Robens went on to declare that it was essential that the machinery of industrial relations should be used in a broad spirit rather than for the promotion of narrow, selfish interests on either side. "It is my firm belief that strikes and lockouts would rarely occur if everybody in industry could be brought to realise how anti-social, how costly, and how futile in the end is the stopping of work as a method of settling disputes and removing grievances." Those statements, from a responsible politician who has studied industrial affairs from the inside of the Ministry of Labour, reflect a realistic approach to our problems. It is regrettable that they were not uttered before the General Election.

Rising Operating Costs

IT IS a pity that the Chamber of Shipping is not able to compile an index of ship operating costs, though such a statistical *tour de force* is hardly capable of realisation. Could it be achieved, however, it would serve to counteract the somewhat hasty conclusions which are sometimes drawn from the Chamber's index of tramp freight rates, particularly when that index figure tends to rise towards double the basic figure of 1948 = 100. Viewed against the background of the increasing cost of ship operating, the freight index of 190.4 for October, which is within 13.4 points of the peak figure reached in May, is not so high as might at first appear, for operating costs have increased even in that short interval. Compared with the average of 84 points, for the whole of 1950, the average index for the first ten months of this year has worked out at 174.3, which is a considerable increase. On the other hand, operating costs have not been stationary all this time. To take bunker prices alone, the spot price for fuel oil in the United Kingdom and near Continental ports was about 99s. per ton in the middle of 1949; now the price is 176s. For diesel oil the price is now about 243s. per ton, compared with 142s. Now the National Coal Board has informed shipowners that the price of coal for bunkers in U.K. ports will be increased by an average of 20s. per ton as from December 17. In the matter of wages, British shipowners have been more fortunate than some others. Since 1948 there has been an increase of £2 in the basic monthly wage of an able seaman, but the National Maritime Board is at the moment considering a claim for a further increase. In American ships, it may be noted, the basic monthly wage has increased from $222 to $263 since 1948. Port charges are increasing so rapidly that it is a matter of the greatest difficulty to keep up with the constantly amended tariffs, yet there has been no corresponding saving in the time taken in handling the ships when they are in port. These, and many other factors, must be weighed in the balance, before making facile assumptions from the trends of the freight index alone.

The "Fifty-Fifty Rule" Again

AMERICAN maritime policy has a good deal to answer for where the economic conditions of sea transport are concerned. Ever since the notorious "fifty-fifty principle" was "enshrined" in the Merchant Marine Act of 1936, the American authorities, egged on by the energetic lobbying of the late Senator Otis Bland, have attempted to keep the American merchant fleet alive by insisting on incorporating in trade agreements with foreign governments the stipulation that the sea transport of at least 50 per cent of the trade concerned must be performed by American-flag ships. The old-established and naturally maritime countries have done their best to resist this discriminating and uneconomic practice, but without conspicuous success. When the trade concerned arose largely as a generous offer of "aid" from the United States, it was, of course, difficult to object to such an arrangement, but unfortunately many of the newer maritime countries have come to regard this proviso as a matter of commonly accepted principle. The latest example comes in the new trade agreement which has been made between Argentina and Germany. Article 2 of the shipping agreement signed by both parties at the same time as the trade pact reserves to the Argentine Government the right to take the necessary measures so that "the interchange of up to 50 per cent of the volume of goods exchanged between the Argentine Republic and the German Federal Republic shall be effected preferentially in Argentine-flag ships." The application of this provision, it is hopefully added, "may not lead to a delay in the delivery of the goods to be carried, or to an increase in the cost of same." If this corollary has any meaning, it is that the main proviso is impossible of achievement, for how can any "fifty-fifty rule," if followed to its logical conclusion, do anything but lead to delay in delivery and add to the cost of transport?

Financial Strength

A COMPLETE loss of properties in Iran—mainly oilfields and the Abadan refinery—would, of course, be a serious matter to the Anglo-Iranian Oil Company. It may be estimated, on the basis of crude oil output, that some 70 per cent of the group's 1950 trading profit of £81,301,000 (against £38,666,000) came from Iran; and on that basis, with 42 years of the 1933 Convention still to run, had not the Iran Government unilaterally terminated the concession, a capital value of around £2,500 million could conservatively be given to the company's concession rights, developed oilfields and

installations in Iran. But the group has, fortunately, so expanded its interests outside Iran that even a total and irretrievable loss of its Iranian assets would not be a mortal blow. In Kuwait the company is an equal partner with the American Gulf Oil Corporation and production is there approaching 40,000,000 tons a year, a figure higher than that coming from the wells of Iran before they were shut down. Anglo-Iranian is also a 23¾ per cent shareholder in the Iraq Petroleum Company, whose rapidly rising annual crude output is now in the region of 20,000,000 tons a year. Refinery expansion continues apace, in this country, on the Continent and elsewhere, and a valuable petroleum chemical industry is being built up. Then, through the subsidiary, British Tanker Company, the group now owns 153 ships of 1,854,000 tons d.w. In February last orders were placed for 21 vessels, including six of 32,000 tons, at a then provisional cost of £21,000,000, so that early in 1954 the group will have 178 ships of about 2,400,000 tons d.w., less any withdrawn in the meantime. A further large fleet is chartered by the group. Finally, Anglo-Iranian has a worldwide network of distribution and sales organisations. It is thus clear that, even if no agreement is reached between A.I.O.C. and Iran for a resumption of the group's operations there, a most substantial and profitable business will remain. The consolidated balance sheet dated December 31, 1950, shows immense strength at all vital points.

After Fifty Years

IT IS 50 years since the business of John I. Thornycroft & Co., Ltd., became a public company. During that period it has surmounted many stresses and strains and has taken many risks expanding its operations and now, as Sir John Thornycroft pointed out at the annual meeting, it is involved in the most extensive and costly rearmament programme that has ever been undertaken by this country. It is a fine example of how private enterprise works. As Sir Reginald Skelton remarked, in proposing that Sir John should be re-elected governing director, more than £50,000,000 have been spent in wages, apart from salaries to management, in those 50 years, while the shareholders, who provided the money for the land, buildings and plant, have received only 7d. in the £ sterling of that amount, and the National Exchequer has taken 3¼d. Those figures show the benefits which the employees and the whole country have derived from the success with which the directors and their staff have gone out into the uttermost parts of the world to secure contracts, in face of keen and sometimes unfair competition. They could not have secured those orders unless great sums had been spent from year to year in maintaining the plant at a high standard of efficiency. And now, as Sir John pointed out, the company has to play its part in the rearmament programme. In that connection he made some remarks with which all the leaders in industry will cordially agree. "The present indications are that shortage of material and lack of adequate labour force, brought about by superimposing rearmament on normal domestic and export business, and past mismanagement of national finance and governmental bulk buying, will have a very serious effect in reducing turnover and increasing costs." As he added, this was most disappointing, "having regard to the efforts that have been made to improve our overseas sales and service organisation." In his opinion the solution for the rearmament period must be the provision of more labour to essential undertakings, as well as the projected reintroduction of an excess profits tax. "Planning ahead is being taken out of the hands of management by Government departments, but all such plans must be abortive if the necessary labour and electrical power is not available to execute the plans."

Whaling Prospects

THE TRADING profits of the Hector Whaling group, including those of the operating subsidiary, United Whalers, Ltd., rose in the year ended July 31 last from £1,374,000 to £1,598,000. Depreciation and the fleet replacement provision together took £520,000, while tax absorbed no less than £644,000, but the net surplus of £397,000 amply covers the 40 per cent dividend payment. Shareholders are also receiving a share bonus of 300 per cent which will take £634,500 from group reserves, which totalled £1,947,000 at the close of the financial year. They thus fare well, although the distribution policy remains conservative. Cash and tax certificates amounted to £970,000 but must be set against current tax liabilities of £230,000 and capital commitments of £986,000, including fleet additions of £850,000. In the year under review the *Balaena* produced 25,550 tons of whale oil and sperm oil; this was 25 per cent less than the previous year's record production, but was the second largest in the Antarctic. During the early part of the season the weather was exceptionally bad. Last season's whale oil output was sold to the Ministry of Food at £100 per ton, compared with £80 the previous season. Sperm oil also realised satisfactory prices, as did meat and liver meal. The coming season's production of whale oil has already been sold at £110 per ton, while good forward contracts have been arranged for the entire meat meal production. An encouraging outcome of the 1951-52 season's operations thus seems assured. The baleen whaling season begins on January 2 next and will continue until April 7 unless cut short by an earlier killing of the internationally permitted 16,000 blue whale units. There is, of course, the debit side of the account to be brought into the profit reckoning. Last season whaling costs were slightly reduced; this year, however, says the chairman, Mr. R. de B. Trouton, costs will be considerably higher. Three more catchers will be employed, while wages have risen substantially, repair costs have increased and the prices of fuel oil, stores and provisions are up.

Standard Fees for Compass Adjusters

THE new schedule of compass adjusting charges announced by the British Nautical Instrument Trade Association comes into effect on January 1, 1952. This association came into being after the First World War, when some of the leading instrument makers combined to establish an examination for a certificate of qualification for compass adjusters, whereby their professional status would be recognised. The new and stringent conditions under which Ministry of Transport certificates have been granted since last year emphasise the importance attached to maintaining the highest possible standard of efficiency. During the Second World War the association was able to assist the shipping industry in solving many wartime problems, one example being the service and maintenance system which was organised for the luminous lifeboat compass. It is recorded that a small number of compass adjusters played a vital part in preventing the Port of London from being closed during the early stages of the magnetic mine campaign, before the introduction of degaussing equipment. The compass adjusters have an important service to render to the shipping industry, in peacetime as much as in war. They are seamen in the true sense of the word, for not only do they have to serve their time at sea and hold a Master's or Extra Master's certificate for a foreign-going ship, but they must also have a complete technical knowledge of the nautical instruments under their care.

BRITISH SHIPBUILDING COMPENDIUM

The 3rd (1951-52) edition of this valuable Buyer's Guide, just published, sets out all known British manufacturers of equipment and materials used in the construction and furnishing of ships.

The 345 headings—ranging from Steam Turbines to Nuts and Bolts and from Drop Forgings to Soft Furnishings—contain over 8,500 entries for more than 3,500 companies. A 32-page index provides easy reference to the separate manufactures of each company.

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ON THE "BALTIC"

EASIER TREND IN THE MEDITERRANEAN MARKET

By BALTRADER

THE Western Mediterranean market has, for some time, been subject to fluctuation and at present is inclined to be easy. It is the time of year when the numerous vessels engaged throughout the summer in the timber trade are one by one discharging their last cargoes of the season from the Baltic, White Sea and Canadian ports. Contracts for the year's sale of ore and other cargoes are nearing completion and the merchants are engaged in negotiating further sales. B.I.S.C. (Ore), the biggest operators, appear to have almost all the tonnage they require to lift their cargoes in North Africa and South Spain, having a good many vessels running on freight contracts arranged months ago. They also have the service of a fleet of large ships which they engaged on time charter. The Fertiliser Manufacturers' Association is similarly in a comfortable position, having arranged freight contracts which cover an appreciable part of their programme for the importation of phosphate. - -

The volume of tonnage available for homeward employment from the Mediterranean is increased by the lack of outward coal cargoes obtainable from the United Kingdom, or even from the near-Continental ports. When vessels engaged in the Mediterranean trade have discharged their cargoes on this side, there is nothing for it but to send them straight out again in ballast for their next homeward cargo. Many ships which are coming off the summer trade with timber are unsuited to the rigours of the North Atlantic in winter and, during that season, are almost confined to the Mediterranean trade. Of these, a good proportion are coal-burners and obtain their cheapest bunker supplies in the United Kingdom; in this important respect, the farther they go the worse they fare. If they have to bunker heavily at, say, Gibraltar in order to get home, a serious hole is made in their earnings. This fact offers an opportunity to charterers loading in the Western Mediterranean; they are able to discount the rate for a voyage which does not consume much fuel.

East of West Italy

The Mediterranean, east of West Italy and including the Adriatic, is a different market; rates home from there and from the Black Sea are more inclined to be stable because coal-burning vessels cannot profitably be operated over the longer distances involved unless at a comparatively high rate. The choice of tonnage available for loading in that area is, therefore, almost confined to oil-burning vessels, which for the most part are of suitable size and age to be traded wherever the most profitable employment is offering. The large purchase of coarse grain from Russia by the Ministry of Food has necessitated the payment of high freights from the Black Sea to the United Kingdom. About half the contracted quantity has been provided for by the charters arranged up to date, but many more will have to be drawn in ballast from home ports. A useful combination has often been arranged by taking grain to Egypt and proceeding thence to the Black Sea without removing the shifting boards used for the first cargo. This may still be possible for ships of "neutral" flag taking grain from North America or Australia to Egypt.

The North American market is rather quieter, but chartering for coal cargoes to Europe goes on fairly steadily. Fixtures of grain carriers have not been numerous lately, but December tonnage is obviously not in much supply, as shown by a recovery of 1s. 3d. per quarter in the rate of 26s. 3d. paid for grain from the Gulf to the United Kingdom for a vessel about ready to leave the near Continent in ballast. The most interesting feature of the trans-Atlantic market is that while $10.50 is the established rate for a single voyage with coal from Hampton Roads to Antwerp or Rotterdam, operators are taking ships on that basis of rate for multiple voyages to the Continent throughout the next 12 months. So many contracts for a number of voyages have been fixed in recent months that the amount of employment in the trans-Atlantic coal trade is somewhat disguised: if every voyage arranged were shown as a separate fixture, the daily freight reports would be much distended. There are so many consecutive voyages to be performed that it materially reduces the amount of new chartering to be done, but the result is the same because a large volume of shipping will be off the market for months to come.

The Freight Market

In spite of the large number of consecutive voyages and big contracts already arranged for coal from Hampton Roads to Europe, inquiry continues to be active. The new N.S.A. rate for coal to the United Kingdom has been announced at 76s. 6d. per ton West Coast and 79s. 9d. East Coast, U.K., with 1,500 discharge free. This basis is a few shillings less than had been expected. Recent fixtures for coal from Hampton Roads include Isbrandtsen contract for 8 voyages to Rotterdam, Antwerp or Havre on basis of $10.50 to Antwerp or Rotterdam, option Hamburg-Bremen at $10.95, December to July, and *Achvo*, 9,000 tons, to Antwerp or Rotterdam, consecutive voyages, January to June at $10.50. Hampton Roads to Buenos Aires has been fixed at $18.75, December, also January. Several vessels have been taken U.S. Northern Range to Japan for coal at $20.25, January, and $20, January/February and February. The *Sussex Trader*, 30,000 quarters, is fixed from U.S. Gulf to U.K. at 26s. 3d., heavy grain, December 28/January 18. The *Irish Hazel* has accepted Gulf to Eire at 27s. 6d. per quarter, heavy grain, January. The *Annice*, 9,000 tons, has been chartered for heavy grain from U.S. Gulf to Antwerp at $15.5, December. The *Kaikoura*, 6,600 tons, will load sugar, Cuba to U.K., at 137s. 6d., January 1/28. The North Pacific market is steady: *Thistledale*, 9,000 tons, is fixed from British Columbia or U.S. North Pacific to U.K. or Antwerp-Hamburg range at 145s., heavy grain, March 5/31—a good rate for so distant a position. The Ministry of Food has been actively chartering December and January tonnage for heavy grain from the Black Sea to the United Kingdom to 105s. The *Petros Nomikos* is fixed from full range Australia to West Italy at 110s., basis bulk wheat ex silo, January 1/31. Time charter has been the outstanding market: the m.v. *Sierra*, 9,300 tons d.w., 520,000 feet bale, 15 knots on 18 tons boiler oil, is fixed for the trip to New Zealand at 75s. per ton per month, delivery Eire, January; *King Malcolm* (m.v.), 9,300 tons d.w., 578,000 feet bale, 12 knots on 14 tons boiler oil, will make the trip to Australia at 70s. per ton per month, delivery U.K., February/March. The *Temple Bar* (steamer), 10,384 tons d.w., 476,000 feet bale, 10 knots on 22 tons oil, is chartered for a West African round at 48s. 3d. per ton per month, delivery U.K., December 10/17.

The following have been elected members of the Baltic Exchange:—

Messrs. R. E. Maxrodeon (Frinton Shipbrokers, Ltd.), D. Robson (Westminster Bank, Ltd.), G. Douglas (Bunge & Co., Ltd.), R. Miles (Arthur Rapp, Ltd.), A. J. French (Harald Isachsen & Co., Ltd.), O. Gross (The Power Steamship Co., Ltd.), L. W. Kellett and C. E. D. Robert-Tissot (F. Hachenlin, Ltd.), H. E. T. Ross (Port Line, Ltd.), C. J. Damola (Ralli Brothers, Ltd.), W. F. W. Brodrick (A. Pihlfe, Ltd.), P. D. Proctor (The Maersk Co., Ltd.), A. S. Gibbs (C. W. Kellock & Co., Ltd.), W. G. Trice (Watts, Watts & Co., Ltd.), J. M. Mees (The Ocean Oil Co. (1942), Ltd.), D. A. Pateras (Lemos & Pateras, Ltd.), Capt. N. Comninos (Reefer & General Shipping Agency, Ltd.), S. A. Stanton (Cory Brothers & Co., Ltd.), J. D. Shaw (Southern Steamships (London), Ltd.), R. A. Roberts (National Provincial Bank, Ltd.), E. P. Lykiardopulo (Lykiardopulo & Co., Ltd.), A. R. Vernon and D. R. Pope (Harper Copeman & Co., Ltd.), and W. G. Murray (Maclay & McIntyre, Ltd.).

DANISH SHIPPING AND SHIPBUILDING

PROBLEMS OF FINANCE : A SHIPYARD'S JUBILEE

By THE SHIPPING WORLD'S Own Correspondent

On November 8 the *Foreningen til Sofatens Fremme* (The Association for the Promotion of Shipping) held a meeting in Copenhagen, at which the well-known young shipowner, Mr. E. Hahn-Petersen, gave a lecture entitled " Danish Shipping and its Problems." Among other things, he explained that the Danish merchant fleet had suffered considerable losses during the war. At the end of 1939 the fleet totalled 1.1 million tons gross and by the end of the war it had been reduced to about 500,000 tons. On November 1, 1951, the total had reached 1,263,000 tons, in addition to which 71 vessels totalling 343,000 tons had been contracted for delivery before the end of 1955. Although this was an advance of about 650,000 tons it was a question whether this development was wholly satisfactory. The average age of the fleet was now 13 years, against 17 years at the end of the war. The fleet had been almost completely self-financed. Only in a few cases had short-term bank loans been given and the increase in capital for 14 of the largest companies amounted to Kroner 35 million. The reparations money received for losses during the war had been quite insufficient to cover similar replacements. Due to the sensible consolidation policy carried out by the shipping industry the revenue earned had in most cases gone towards reconstruction. This had also been possible through the greater understanding shown by the State authorities of the national economic importance of the shipping industry, so that owners can, over two or three years, write off 50 per cent of the building or purchasing cost.

Danish Tankers

Tankers are a somewhat new type in the Danish fleet. Except for the vessels of A. P. Moller and one of the large oil companies, Denmark had no such vessels before the war. As a shipowner, Mr. Hahn-Petersen said that this was without doubt a fault on the shipowners' side, and many of them should have foreseen developments and been in on the first development in the tanker trade. The Norwegians with their initiative and greater foresight had left us far behind. Only now, since the war, have other Danish owners realised that they cannot just let other countries take part in this trade alone. On November 1 this year the Danish tanker fleet totalled 445,000 tons deadweight, against 165,000 tons at the outbreak of the war. Furthermore, 226,000 tons had been contracted for delivery before the end of 1955. Mr. Hahn-Petersen hoped that the Danish shipping industry in general would have the initiative and financial strength to take part in the transport requirements of the world. Unfortunately the trend of prices had hindered the formation of new shipping companies. It was difficult before, but still more difficult today, because of the amount of capital necessary to start a company. The difficulties would no doubt be still greater because of the restrictions on credit.

At a meeting of the board of directors of the Port of Copenhagen on October 26 the port director, Mr. Mogens Black, submitted the budget for 1952. This pretty well follows the calculation for the present year. The actual working income, however, shows an increase from 8.9 to 9.5 million Kroner and the working expenses show an increase from Kr.5,570,000 to Kr.6,275,000. A reduction of profit is expected by Kr.117,400 to Kr.659,600. It is worth noting, however, that the accounts for this year show a profit of Kr.1,214,600, against a budgeted profit of Kr.777,000. The increase in income in comparison with the present year is mainly due to larger income from harbour dues, greater goods traffic than calculated for this year, and increased rent for premises, etc. The increase in expenses is mainly caused by the rise in wages and prices. Traffic of the port measured in net tonnage and goods for the present year is expected to be smaller than in 1950, when the figures were 8,700,000 tons net and 7,500,000 tons of goods. The statistics show an increase in the net tonnage during the first nine months and in goods during the first six months, but it is not expected that this will be kept up for the remainder of 1951.

The claim by The National Bank of Denmark against J. Lauritzen, of Copenhagen, for about Kr.4 mn., reported in THE SHIPPING WORLD of October 31, was brought before the Superior Court of Justice on November 9 and resulted in the claim being turned down. The National Bank was ordered to pay Lauritzen Kr.25,000 costs. The Danish National Bank has appealed and the case will in due course be brought before the Supreme Court.

The Svendborg Shipyard

Svendborg Skibsværft celebrated its 25 years jubilee on November 1. The yard is much older than that, but it is 25 years since the present limited company was formed. The yard itself came into existence about 1859. Between 1907 and 1916, 21 vessels were built at the yard, which was then known as " Ring Andersens Steel Shipyard." Negotiations during the First World War led to the starting of Svendborg Skibsværft & Maskinbyggeri, Ltd., but this company went under during the depression in the twenties and was closed in 1925 after having built 11 ships. This was something of a catastrophe for Svendborg, as well as for Danish shipbuilding. A number of prominent citizens got together, and with the assistance of the Sydfynske Steamship Company, the Ærø Steamship Company, A. P. Moller and others, the present company was started in 1926. Everything went well until 1931-32 when the turnover fell and profit became loss. The liquidation of the company was considered, but luckily some optimists on the board of directors succeeded in getting a year of grace, and that year went well. In 1939 the turnover was Kr.2,200,000 and last year the highest-ever figure of Kr.12,152,000 was reached. During the last 25 years the yard has built 27 vessels, as well as the hull of the Copenhagen tug *Grane*. Repairs have also played a big part in the programme of the yard and plans are being made to enlarge the 1,700-tons dock so it will be able to take vessels of up to 4,500 tons deadweight. The yard is of great importance to the town of Svendborg and the Danish shipping industry. Originally 300 workers and 10 office staff were employed and today the figures are 500 and 34.

Liquid Gas Carrier

Kosangas, Ltd., which has previously imported liquid gas by rail from Sweden and Holland, has become the owner of Europe's first tanker for the transport of liquid gas. This tanker is the *Kosangas*, of 148 tons gross, which was built in Holland as an ordinary cargo vessel in 1947 and has been converted at Svendborg Skibsværft. The tank itself is Danish built and is a steel cylinder with a length of about 108 ft. and a diameter of about 11 ft. It weighs 50 tons and has a capacity of 130 cubic metres. It can carry 65 tons of liquid gas, which corresponds to 200,000 cubic metres of town gas. It is the owners' intention to procure another and larger vessel, as it is intended to import some gas from a new refinery in England.

The Steamship Company Progress (Marius Nielsen & Son), Copenhagen, has ordered two 1,600 tons gross motor vessels from Svendborg Skibsværft. The Steamship Company Vendila (Svendsen & Christensen), of Copenhagen, which recently sold the 3,230 tons d.w.

(*Continued on page 408*)

ANGLO-IRANIAN OIL COMPANY

FIRST FULL STATEMENT ON SITUATION IN IRAN

Sir William Fraser on Current Developments

THE 42nd annual general meeting of the Anglo-Iranian Oil Co., Ltd., will be held on December 20 at the Chartered Insurance Institute, 20 Aldermanbury, London, E.C. The following is an extract from the statement to stockholders by the chairman, Sir William Fraser, C.B.E., which has been circulated with the report and accounts for the year ended December 31, 1950:—

The group trading profit is £81,300,622, which is the highest ever achieved. The gross profit of £115,495,994, compared with £63,020,405 last year, results from all of the widespread activities in which the company is interested.

Since my last statement to stockholders on June 20, 1950, there have been a number of events in Iran that have gravely injured the company's interests in that country. The company hitherto has preserved silence in order not to embitter any further its relations with the Imperial Iranian Government and thereby render the chances of effecting a satisfactory settlement of the questions at issue more remote.

In my last statement to you, a brief account was given of the supplemental agreement to the company's 1933 convention, which had been signed with the Iranian Government on July 17, 1949, and which was then awaiting ratification by the Iranian Majlis. At the time, the terms were the most advantageous offered to any country then producing oil in the Middle East. In January 1951 it was reported in the Press that the Arabian American Oil Company had made an agreement on December 31, 1950, with the Saudi Arabian Government for an equal sharing of the profits from its oil operations in Saudi Arabia, after deduction of United States income tax. The company thereupon informed the Iranian Prime Minister of its willingness to consider a new agreement on similar lines.

During the negotiations for the 1949 Supplemental Agreement the straight 50/50 profit-sharing scheme came up for discussion, but after lengthy examination it was discarded in favour of increased payments under the existing methods of the 1933 Convention. There was no question of the A.I.O.C. being behindhand or less generous in its revised payments than other companies operating in the Middle East; the record shows the reverse to be true.

Oil Industry Nationalised

Despite the company's endeavours to persuade the Prime Minister to make known in Iran both the company's offer to reopen negotiations for a 50/50 profit-sharing scheme, and its action in undertaking to make advances, General Razmara refused to do so and maintained the closest secrecy regarding both matters. The result was that the Iranian public were not informed of them until some time after Dr. Mossadeq had, on February 19, put a formal proposal to the Oil Committee for the nationalisation of the Iranian oil industry. A Bill nationalising the oil industry became law on May 1, by which time Dr. Mossadeq had become Prime Minister.

Besides breaking the solemn undertakings embodied in the 1933 Convention the Iranian Government went so far as to deny that this company even existed, referring consistently to it as "the former company." A violent campaign of unfounded vilification was directed against it, ancient grievances and charges being revived and new ones invented.

On May 30 the Iranian Government in a note to the company expressed a desire to use the company's knowledge and experience in making its arrangements for the implementation of the Nationalisation Act. Accordingly, a delegation consisting of four directors with members of the company's staff, led by the deputy chairman, Mr. B. R. Jackson, reached Tehran on June 11 and 12. The Iranian Government delegates rejected the proposals made by this delegation out of hand after no more than half an hour's consideration; in so doing they made it clear that they considered the discussions closed.

It was at this stage that the Iranian Government accepted President Truman's suggestion that Mr. Averell Harriman should visit Tehran for discussions on the oil dispute. Mr. Harriman arrived on July 15, and, after lengthy examination with the Iranian Government of a formula, consistent with the recognition of the principle of nationalisation as approved in the Single Article Law of March 20, on which negotiations with His Majesty's Government could take place, a British Government Mission, led by the Rt. Hon. Richard Stokes, arrived in Tehran on August 4.

Owing to the persistent endeavours of the Iranian Government to confine the discussions to a narrower field and, in particular, to a failure to reach agreement on arrangements for efficient management of the operations in Iran, the Lord Privy Seal's proposals were withdrawn and the talks were suspended.

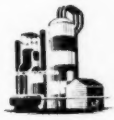
Unfounded Allegations

I cannot conclude this account without making a clear statement on behalf of the company with regard to the accusations that have been made by the Iranian Government to the effect that the company has been guilty of falsification of its accounts, that it has used political interference in order to further its interests in Iran, that it has encouraged administrative corruption in Iranian Government departments and that it has undermined the independence of the Iranian nation. It is a matter of regret to the company that the Iranian Government should, by such a distortion of facts, present the company in a completely false light to the world. Not one shred of valid evidence has been or can be produced by the Iranian Government in support of these accusations, and the company categorically denies that there is any truth in them whatsoever.

Current Developments

Because of the situation in Iran, described earlier in this statement, there have been important developments during the current year in the company's widespread interests and operations outside that country. An erroneous impression exists in some circles, owing perhaps to the company's name, that its assets and activities outside Iran are not very substantial. As stockholders are aware, they included at the end of 1950 large crude oil resources and refining capacity in various countries, the whole of our worldwide transportation, distribution and marketing organisations, research stations and administrative services.

We have now at our disposal crude oil production at the rate of about 20,000,000 tons per annum from our interests in Kuwait, Iraq, Qatar and the United Kingdom, which is almost double what we obtained from these sources during 1950. As regard refining capacity, intensive and successful efforts have been made to increase throughputs at our various establishments outside Iran. Throughput at Llandarcy, for instance, is now at the rate of 4,000,000 tons per annum and at Grangemouth 2,250,000 tons per annum. Our total refining throughput outside Iran is now at the rate of over 14,000,000 tons per annum (and we have processing agreements with other companies for a further 5,000,000 tons per annum), comparing with 8,000,000 tons at the end of 1950. Additions now in hand, including the Kent refinery, should increase this total to

Anglo-Iranian Oil Company group, and Associated Companies.	1950	1949
Crude oil production.	**Tons 41,720,000**	*Tons 33,937,000*
	produced in the Middle East (Iran, Iraq, Kuwait, Qatar) and the United Kingdom.	
Refinery throughput.	**Tons 31,507,000**	*Tons 27,982,000*
	at 13 refineries in 	*at 12 refineries in*
	Australia	*Australia*
	France	*France*
	Germany	*Germany*
	Iran	*Iran*
	Iraq	*Iraq*
	Israel	*Israel*
	Italy	*Italy*
	Kuwait	*Kuwait*
	United Kingdom	*United Kingdom*
Sales of refined products and crude oil.	**Tons 38,500,000 (approx.)**	*Tons 30,500,000 (approx.)*
	The sales organisation includes major marketing or supply interests in the United Kingdom, Continental Europe, Africa, Near and Middle East, India, Pakistan, Ceylon, Australia and New Zealand ; also international ships-bunkering and aviation services.	
Ocean-going tanker tonnage owned.	**Deadweight tons at end 1950 1,717,000**	*Deadweight tons at end 1949 1,530,000*

over 20,000,000 tons by the end of 1952. Urgent consideration is being given to the building of further new refineries.

Our shipping organisation, comprising the British Tanker Company's fleet with a very large chartered tonnage totalling in all more than 300 ocean-going tankers, remains fully and actively employed on the company's trade. On the marketing side, despite the fullest use of our own resources of crude oil and refining capacity, there has inevitably remained a substantial gap between available supplies and our current market requirements. To close this gap we have resorted to purchases from other sources and arrangements for crude oil to be processed for us by other refiners. It is a remarkable tribute to the resourcefulness and flexibility of the world oil industry that the supply problems caused by the cessation of shipments from Iran have been so successfully faced.

COAL AND OIL

INCREASE IN COAL BUNKER PRICES

THE INCREASE in the price of British coal bunkers announced recently, which will take effect on December 17, will bring bunker prices in British ports from about £4 10s. to about £5 10s., raising the price by rather less than 20 per cent. This latest rise in fuel prices comes closely after a rise in the price of oil fuel, which in all has gone up some 30 per cent in price in the last year for ports in the Eastern Hemisphere. The new coal bunker prices follow the general upward trend of coal—and all other—prices, and reflect the continued scarcity of coal in Europe. Despite the rise, British bunker prices are still lower than those of many other countries. It is estimated that the increased revenue to the National Coal Board will amount to some £3 million. This sum, though useful, will go only a little way towards meeting the proposed pay advance for miners, which will account for some £26 million. One effect of the new coal prices will be to increase the attractiveness to shipowners of conversions from coal to oil firing. If fuel prices in general continue their upward climb, the possibilities of replacing steam machinery altogether by medium-speed diesels geared to the shaft will no doubt be given close consideration by many shipowners.

Anglo-Iranian Developments

THE MAIN points of Sir William Fraser's statement as chairman of the Anglo-Iranian Oil Co., Ltd., are discussed elsewhere in this issue of THE SHIPPING WORLD. He gave a full exposition of the events leading up to the present position in Persia, in which he was able to vindicate the company completely from the attacks made on it. Apart from the charges emanating from Iran, which have had no substance whatsoever, these have largely been due to the fact that the late General Razmara insisted on secrecy being maintained over the company's offers to him. The main proposals received little or no publicity in Iran, while the fact that the company was equally prepared to consider a 50-50 basis for operations, and offered to do so as soon as the Arabian-American agreement on this basis was signed, has only now been made public. Sir William ends his statement with a full report of the activities of Anglo-Iranian in 1950, to conclude what must be one of the longest statements produced by a company chairman in recent years. He reported that good progress is being made with the new 30-in. pipeline from Iraq to Banias, in Syria, while the pipeline from the Iraq Petroleum Company's oilfield in Southern Iraq to the Persian Gulf (at Fao, near Abadan) has been completed. In the United Kingdom, the expansion of the Llandarcy refinery has made necessary the enlargement of the berthing facilities at Queen's Dock, Swansea. Five new reinforced concrete jetties are being provided, of which two were completed in 1950. The company's sales of crude oil and refined products rose in 1950 by 8,000,000 tons, and reached a total of 38,500,000 tons. In addition, the company's receipts were also augmented by the increased value of oil products, expressed in sterling, which followed devaluation. Expansion continues in the supply by Anglo-Iranian of ships' bunkers. As one of the main suppliers of shipping, the company now has its bunkering organisation in operation at some 150 ports.

Indian Oil Refinery Projects

THE RECENT announcement that representatives of both dollar and sterling oil companies were engaged in negotiations with Delhi for the construction of oil refineries marks a new phase in the establishing in India of a refining industry based on imported crude. The Indian Government made it clear at an early stage that the setting up of new refineries would accord well with its programme of industrial development. At its request a mission representing leading American and British oil companies was sent out in 1948 to report upon the possibility of embarking upon the construction of one or more refineries. India's former dependence upon Abadan for some three-quarters of its oil imports has been one of the factors leading the Indian Government to extend a fresh invitation to the oil companies to send representatives to Delhi for further discussions. Standard-Vacuum has opened negotiations for the construction of one refinery, while Burmah Oil and the Shell group—the partners in Burmah Shell—together with representatives of Burmah Shell itself, have sent a party to discuss joint plans for another plant. A third plant may be built by Caltex. At present, India's one refinery is at Digboi, in Assam, where only the output of the local field is processed. The projects at present under consideration would involve the erection of large-scale refineries with an annual capacity of one to two million tons each. With the exception of small quantities of products which might still be imported for technical reasons, the new refineries would be able to cater for the whole of India's demand, which now totals some 3.5 million tons yearly. If the present plans come to fruition, Bombay may be selected as a site for more than one refinery. Of the country's two other major ports, Calcutta's river approach is unsuitable for large ocean-going tankers, while Madras is an economical supply centre for south India only.

OFFICIAL NOTICES

New Companies

HARRIS & CO. (SHIPPING), LTD., Par Harbour, Par, Cornwall. Registered November 14. To take over business of shipbrokers carried on at Par, Cornwall, as "Harris & Co." Nominal capital: £4,000 in £1 shares. Directors: W. H. J. Harris, Mrs. F. M. Harris and A. J. Tregaskes, all of Par, Cornwall

PRECIOUS SALVAGE, LTD., Plantation House, Fenchurch Street, London, E.C.3.—Registered November 8. To carry on business of salvers and contractors for the removal and clearance of hulks, wrecks and obstructions in and from ports, harbours, docks, rivers, etc. Nominal capital: £10,000 in £1 shares. Directors: Not named. Subscribers: U. C. Robinson, Plantation House, Fenchurch Street, London, E.C.3, P. H. North Lewis, 53 Leadenhall Street, London, E.C.3 (solicitor).

[Information from *Jordan's Daily Register of New Companies*]

RECENT SHIP SALES

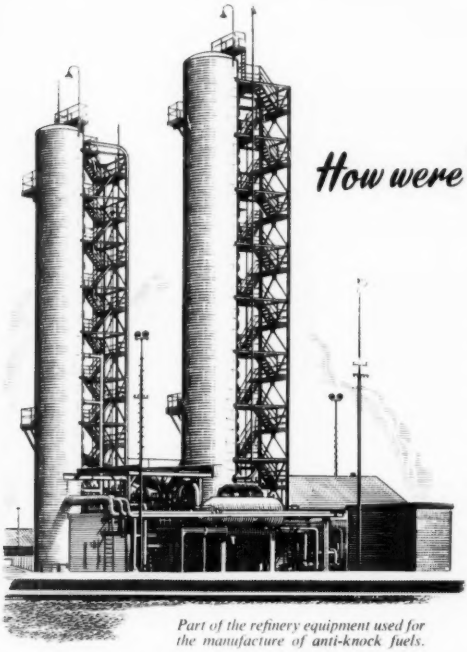
The Baltic type cargo steamer *Skidby* (1,811 t.g.), owned by the Kingston Navigation & Trading Co., Ltd. (W. Brown, Atkinson & Co., Ltd.), Hull, has been sold to Norwegian owners for about £90,000. Built by the Pacific Bridge Co., San Francisco, Cal., in 1943 and formerly named *Cyrus Scars*, she has been renamed *Borgfred*.

The Shamrock Shipping Co., Ltd., Larne, has sold the cargo steamer *Glynn* (1,787 t.g.) to the A/B Anchor Shipping Co., O/Y, of Helsingfors, Finland, for about £110,000. Built in 1925 at Le Trait by the Atel & Ch. de la Seine Maritime, and originally named *Ostrevent* (later *Capitaine Arsene Guillevic*), she has a speed of about 10 knots and a deadweight of 2,311 tons.

The Dene Shipping Co., Ltd., London, has sold the cargo steamer *Riodene* (4,882 t.g.), built in 1947, to the Silver Line, Ltd., London. She will be renamed *Silvertarn* and has a speed of 10½ knots with a capacity of 8,910 tons d.w.

The cargo steamer *Dunstan* (2,993 t.g.), owned by the Booth Steamship Co., Ltd., Liverpool, and the Liberty type cargo steamers *Pacific Star* (7,259 t.g.) and *Oregon Star* (7,283 t.g.), owned by the Blue Star Line, Ltd., London, have been transferred to the Lamport & Holt Line, Ltd., Liverpool. They are to be renamed *Sallust*, *Lalande* and *Laplace* respectively.

INTERESTING FACTS ABOUT OIL



Part of the refinery equipment used for the manufacture of anti-knock fuels.

No. 10.

How were "Anti-Knock" fuels developed?

Study of the characteristics of the less easily detonating fuels led, in the period from about 1920 onwards, to new methods of producing motor spirits. Often the product distilled directly from crude oil had a low anti-knock value, and recourse was then had to "cracking" heavier fractions of the crude by subjecting them to a period of high temperature and pressure, during which chemical changes took place giving a different type of fuel. Blending of the cracked spirit with some of the straight run material from the original spirit produced an acceptable motor fuel for the changed needs of the market.

This and other alterations in refinery technique called for new tests to control quality. The old laboratory methods did not give a satisfactory guide to anti-knock value and special test engines were therefore designed in which all blends were examined to ensure that the requisite quality was reached. Other chemical tests were necessary because the "cracked" spirits, if not suitably refined, could be unstable in storage and form gummy deposits.

Almost at the same time as the use of cracked spirit became general, the research of Midgley and Boyd led to the discovery of the remarkable anti-knock properties of tetra ethyl lead when blended with motor spirit in very small quantities (e.g. 0·5 to 3·6 millilitres per gallon of spirit). In recent years 66,000,000 lb. of tetra ethyl lead were produced annually (in effect, enough to raise 20,000 million gallons of average straight run spirit seven octane numbers in rating).

The present day needs of aviation spirit are the most exacting of all, requiring complicated processes to produce the components for blending. This development was one of the major achievements in the petroleum world from 1939 to 1946 and one in which the Anglo-Iranian Oil Company played a considerable part. The problem is not simplified by the need for fuels with a very low freezing point (not above -60° C.). Further, aviation fuel must be capable of long storage without loss of anti-knock qualities, which excludes any fuel components likely to form gum, combined with the maximum economy at cruising speed and maximum take-off power.

WM CORY & SON LTD GENERAL BUNKER SALES AGENTS

INTERNATIONAL OIL BUNKERING

BP

ANGLO-IRANIAN OIL COMPANY LIMITED

WM. CORY & SON LTD., CORY BUILDINGS, FENCHURCH STREET, LONDON, E.C.3

About Aluminium... 6

MECHANICAL PROPERTIES · *concluded*

This is one of a series of articles on the characteristics of the metal and its structural alloys, written for the interest of students and others.

IN all metals and alloys, protracted static loading may cause "creep", and repeated dynamic loading, "fatigue"; either of these phenomena can cause failure at quite low nominal stress levels.

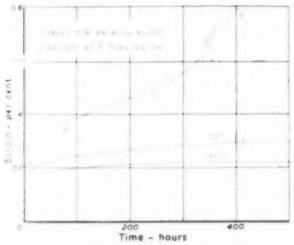
Fortunately, the ordinary user of the structural alloys of aluminium is very unlikely to meet creep in practice, and fatigue is usually important only where stress levels are high, as in aircraft structures.

Creep

It seems likely that all metals flow under stress, though in the great majority of engineering applications this process is extremely slow at normal temperatures, and can be disregarded.

This is so with the structural alloys of aluminium; only the nearly-pure metal, in its soft state, shows significant creep at room temperature. If the working temperature is raised, however, the creep characteristics of the selected alloy may have to be considered by the designer.

The information available to him is generally the result of tests on tensile specimens subjected to constant stress at a carefully controlled temperature. By loading a number of specimens at different stress levels and constant temperature, or at different temperatures and a constant stress, perhaps for some thousands of hours, a family of curves can be obtained of the form shown in the graph below. In each of these curves, deformation increases in four stages: first elastically, on loading (O to A on the top curve); secondly (A to B), at a decreasing rate; thirdly (B to C), at an almost constant rate, which may be negligibly small at low stresses and temperatures; and lastly (C to D), at an increasing rate which leads to failure. In this example, only the top curve has entered the final stage.



Creep Curves

The designer, faced with a known operating temperature, must limit the working stress to a level at which the final stage of the creep curve will not be entered during the intended life of the product, and at which the total deformation at the end of this time will be within acceptable limits.

It is necessary to curtail ordinary creep tests to a practicable duration, usually to a point where the creep rate has settled down to a steady value. For the aluminium alloys a typical period is 1,000 hours.

Fatigue

When discussing work-hardening in a previous article, mention was made of the internal movements in the structure of plastically deformed metal, which take place as slip in or at the surface of individual crystals.

Even when a metal is stressed within its elastic range, this slip is not entirely absent, though for steady or occasional loading it is quite innocuous. If, however, the load is removed and reapplied (or varied in magnitude) a great number of times, repeated slipping may at length cause a definite separation, or fatigue crack, in the plane of slip. This will spread until the part fails.

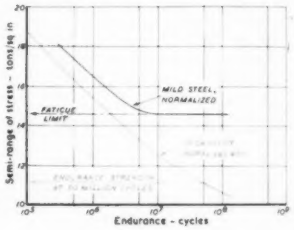
Ability to withstand fatigue may best be determined by repeated loading of the actual part, if this is convenient, but more often standardized test-pieces have to be used. The cycle of loading may be from zero to a predetermined tensile or compressive stress, or consist of a variation about a steady stress, or entail a reversal from tension to compression. Bending, shear, or torsion may be applied instead of (or as well as) tension or compression. In short, an attempt is made to reproduce the conditions of service.

Machines have been developed to apply these various types of loading. A simple and well-known example is the Wöhler machine, in which a cylindrical specimen is arranged as a beam or as a cantilever under a steady load. Rotation of the specimen subjects it to sinusoidally reversed bending.

Unlike creep testing, fatigue testing can be speeded up; the results are not prejudiced until frequencies of the order of 500 cycles per second are approached. This enables many millions of cycles to be applied in a practicable time, and resonance, mechanically or electrically excited, can often be used to save power.

The usual procedure in fatigue testing is to test a number of specimens at different stress levels. By plotting, in each case, the stress against the number of cycles necessary to cause failure, a stress/number (S/N) curve is obtained of the type illustrated below.

It will be seen that the S/N curve for the mild steel flattens out eventually, implying that there is a level of stress below which the material will never fail. This stress is its "fatigue limit." Most of the aluminium alloys, like other non-ferrous metals, do not show this limit (exceptions are provided by the aluminium-magnesium alloys), so it is necessary to quote the maximum stress permissible for a specified life: 50 million cycles is a widely used figure for aluminium alloys.



S/N Curves

At this number of cycles, the endurance strengths, based on rotating cantilever tests, of two diverse aluminium alloys in extruded form are: Noral 2SM (commercially pure aluminium), 3 tons per sq. in. or 60% of the U.T.S.; and Noral 26 SWP (a heat treated aluminium-copper alloy), 11 tons per sq. in. or 33% of the U.T.S. These figures illustrate the tendency of the "fatigue ratio" (endurance strength/U.T.S.) to fall with increasing strength and hardness.

Fatigue resistance may be much reduced by surface irregularities, even machining marks, which, by producing small zones of intensified stress, promote cracking. It is usual, except in tests on actual parts or representations of them, to polish fatigue test-pieces. The designer must, therefore, in using data from conventional fatigue tests, make allowance for the probably inferior form and finish of his product. Improved life can often be realized by shot blasting or otherwise peening surfaces that will be under tensile load, so as to develop residual compressive stresses in the skin.

These discussions are necessarily in general terms, and there is no room to give, except as isolated examples, quantitative properties of the aluminium alloys.

We shall, however, be pleased to send you a copy of our Data Sheet, listing mechanical and physical properties of Noral wrought and cast alloys. When writing, please mention the name of this journal.

NORTHERN ALUMINIUM COMPANY LIMITED
TECHNICAL DEVELOPMENT DIVISION · BANBURY, OXON

Monthly Light Alloys Section

THE WORKING OF ALUMINIUM

ABSTRACTS FROM AN A.D.A. HANDBOOK ON SHIPYARD PRACTICE WITH LIGHT ALLOYS

THE METHODS of working aluminium closely follow practice with steel, so that in general existing shipyard tools may be used. In forming, aluminium responds best to the "easing" technique, allowance being made for greater springback than with steel, the precise amount depending on temper. Tools should be polished, and forming tools liable to bruise the work are better avoided. For very severe forming, interstage annealing or, with suitable alloys, carefully controlled heating may be necessary.

Plate shearing with the normal shipyard equipment for steel is satisfactory but the blades of the shears should be kept sharp and well set up for the softer material. Longer cuts can be made before snipping off and there is less kick-up than with steel. For the lighter scantling materials, the guillotine, rotary shearing machine and nibbling machine are used as appropriate to shape. Holes punched in aluminium plate have little rag or burr at the edges. Tools and clearances as for steel practice can be used, clearances of 8-10 per cent of punch diameter being customary. Aluminium alloys of the non-heat-treatable type (N4, 5, 6) are readily cold formed with usual shipyard tools and should present no particular problems to the operator provided the material is in a suitable temper. Cold working increases the strength and hardness of the material, to an extent depending upon the degree of working, and thus the increase is naturally most noticeable where the deformation is greatest.

Sections are in general readily worked, normal shipyard methods often being suitable, and small frames with little curvature, for example, are formed cold. Additional dogging down may be necessary, the dogs having flat palms to protect the aluminium surface. Further protection of the surface of the aluminium section is afforded by facing the flat palms with aluminium sheet and using hammers faced with rawhide; this precaution greatly reduces surface damage, which can otherwise become excessive on a difficult bend. Machine and hand bevelling (Fig. 1) can be successfully accomplished with the normal shipyard tools, but for large bevels the softer alloys and tempers should be used; for example, alloys NE5 and NE6 are more easily formed that HE10-WP. (Extruded sections can be supplied with any given angle of bevel.) Plates and sheets are generally formed cold; this includes bends with a small degree of double curvature. Cylindrical forms in plate and sheet are easily rolled in shipyard machinery for steel (Fig. 2), but, as with other forming, the alloy must be of suitable temper. Rolls previously used for other metals should be wirebrushed to avoid contamination of aluminium. Lazy joggles should preferably be used with aluminium, and a backing strip with well-radiused edge is advisable to prevent nicking. Plate "of flanging quality" should be ordered where necessary, as the minimum radius of bend is dependent upon the temper.

Hot Working

Hot forming under controlled conditions is limited to the non-heat-treatable alloys, and preferably to the aluminium-magnesium alloys N4 and N5. While these materials can be hot worked at temperatures up to about 425 deg. C., heating to temperatures of the order of 200 deg. C. is often sufficient to assist forming. Naturally, the higher the temperature within the range, the easier the working. Alloy N6 may be hot worked under controlled conditions. The heat-treatable aluminium-magnesium-silicon alloy H10 should only be heated for forming if facilities are available for re-heat-treatment in order to restore the mechanical properties. When heating frames on the bending slabs, heat should be applied gradually and by a continuous stroking action with a soft flame in order that the heat shall penetrate the full depth of the material, otherwise high temperatures may be reached locally. When a useful, safe hot working temperature is reached, a pine stick drawn along the surface of the aluminium will leave a brown char mark. More accurate indication of temperatures is possible by means of "Tempilstik" (J. M. Steel & Co., London) crayons. Care should be taken not to play the flame on or near the crayon mark.

The hot bending of heavy sections, such as frames, is much easier if they are heated in a suitable furnace instead of being heated on the slabs.

Hand-operated bar folders are suitable for forming small quantities of light-gauge sheet, the sheet being gripped in the machine and the metal bent back on itself. Single-curvature parts of large radius are best formed in bending machines of the roller type. The press brake is a versatile tool for making bends in sheet and strip metal and for certain folding operations. As it is capable of considerable adaptation, it has been widely used for aluminium. Panel beating is a method—particularly suited to aluminium—of producing a small number of hollow forms by hand. The "split and weld" system is frequently used, and many common forms, such as pipe bends and ducts, can be made in this way. In making a choice of material for forming and service, the alloys specified in B.S. 1470 provide the user with a wide range of materials.

Machining of Aluminium

Aluminium is readily machined. With appropriate adjustment of tool angles to suit a different material, shipyard equipment for steel is suitable, but speeds can be on the whole greater than is customary for mild steel. The installation of higher-speed machines is largely a question of economics, depending upon the opportunities in a given yard to take advantage of faster production. As an indication of the possibilities, circular saws, cutting aluminium, can be run up to 15,000 ft./min. (4,572 m./min.). Bandsaw machines (woodworking type) are suitable for pure aluminium and the softer alloys of light gauge, using a saw with about 7 teeth to the inch (10 dent = 3.6 cm.) widely set for chip clearance. Aluminium is also cut successfully with a joiner's ripsaw. The circular saw is preferred for plate and heavier sections and saws with inserted teeth of cemented carbide are used to give the highest working speeds. Hand hacksaws should have fairly coarse teeth (about 8-10/in.—2-3/cm.) and be of the wavy-set type, which will prevent the saw binding. Planing operations can be done with high-speed tools, and speeds of 60 ft./min. (18-19 m./min.) are suitable, but cutting tools with angles to suit aluminium will give better results. In turning, front and side clearances are important and vary from 6 deg. for the softer alloys to 10 deg. for the harder alloys. As drilling speeds can be assured to be higher and feeds lower than for machining steel. At high speeds or for drilling deep holes, a spiral angle of 40 deg. or more is required to cope with swarf.

A helical reamer should be used with aluminium alloys, the lead being opposite to the direction of rotation. For ordinary hand tapping and for general work, standard ground thread taps are suitable. In machining aluminium some form of lubricant or cooling fluid is usually desirable, and a satisfactory compound for general purposes is a mixture of mineral oil or lard oil and paraffin. A mixture of equal parts is generally used for light work, but in machining operations such as reaming and tapping a larger proportion of lard oil should be used.

Aluminium can be joined by riveting, bolting or welding. At present riveting is by far the most used method of joining aluminium in shipwork. The British Standards Institution is at present preparing a Standard for aluminium rivets $\frac{1}{8}$ in. to 1 in. diameter. Meanwhile, recommendations for driving practice must necessarily be regarded as tentative in relation to the future Standard for rivet material. The following recommendations are based on British investigations and field tests on rivets of $\frac{5}{8}$ in. to $\frac{7}{8}$ in. (16 mm.-22 mm.) diameter. Table I shows rivet materials recommended for shipbuilding work, and complying in composition with Lloyd's Tentative Requirements. For shell plating of complete aluminium hulls, rivets of N5 are particularly recommended.

TABLE I.—MINIMUM MECHANICAL PROPERTIES OF RIVET BAR

	Specification Minima of Rivet Bars			*Ultimate Shear Stress* Min. Design Value for Driven Rivets in Shear*
B.S.1476	0.1% *Proof Stress* tons/in.²	*Ultimate Tensile Strength* tons/in.²	*Elong.* % on 2 in.	tons/in.²
N5	6	14	18	10
N6	8	16	18	12
H10-W	7	12	18	11
H10-WP	15	18	10	13

* Values for shear strength are not included in the Standard, and the figures quoted are based on tests on rivet stock and on driven rivets. The values are calculated on actual hole diameter.

In places where it is not necessary to develop the full tensile strength of the rivet in the driven point, the hammered or batt point always associated with a small countersink is satisfactory. Various angles of countersunk point are used. For squeeze driving the N.A. cone point is useful because of the low closing pressure required.

The Working of Aluminium in the Shipyard

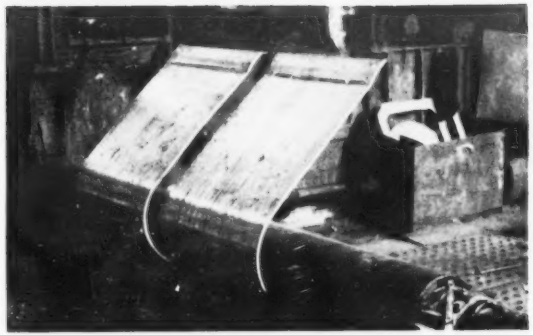
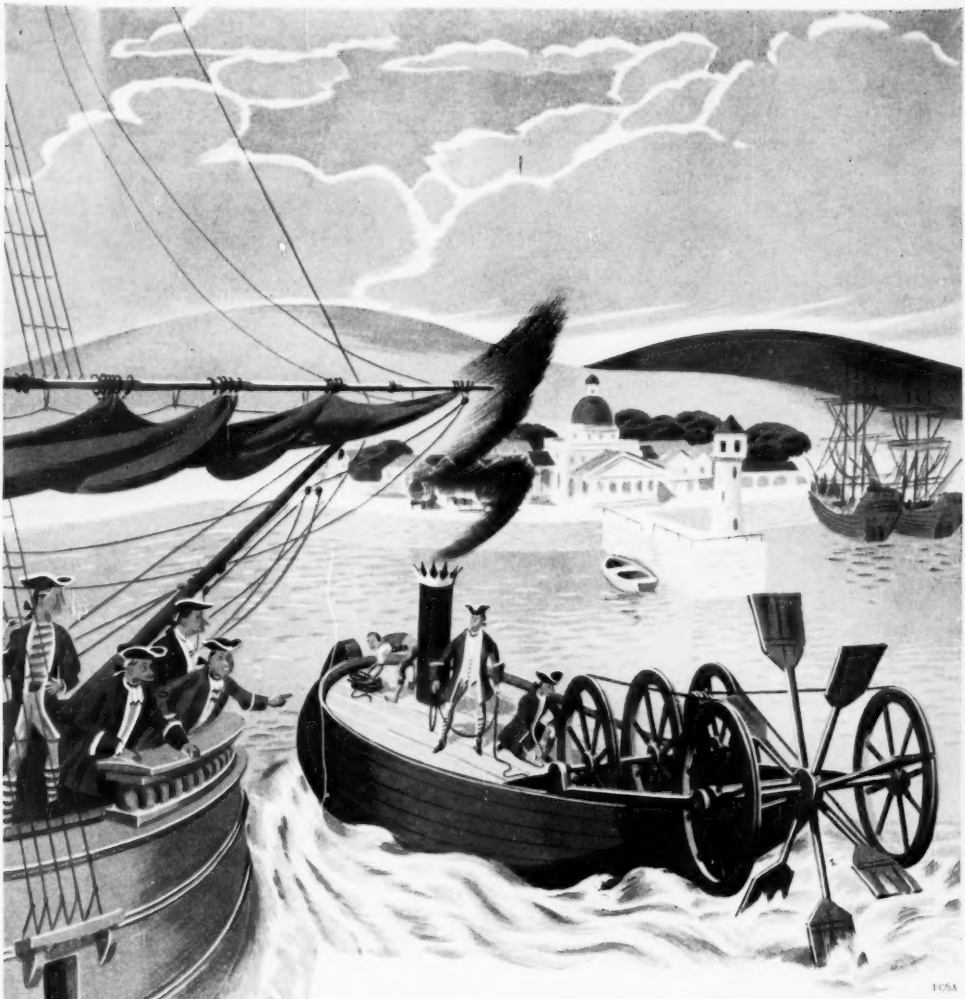


Fig. 1 (*Top left*). Hand bevelling of aluminium extruded section, cold. Hot forming technique makes for easier working with the use of fewer dogs

Fig. 2 (*Top right*). Rolling aluminium plate ¾ in. thick to radius of 10 in.

Fig. 3 (*Left*). Argon-arc welding with a non-consumable tungsten electrode and filler rod

Fig. 4 (*Right*). "Consumable electrode" process



Jonathan Hulls's ingenious steam-tug made quite a stir when it first appeared in 1736. But with its clumsy condensing engine and heavy hull it used too much power in driving itself through the water. Nowadays, of course,

MODERN ENGINEERS SPECIFY

DURALUMIN

REGD. TRADE MARK

The Strong Light Aluminium Alloy

BOOTH BIRMINGHAM

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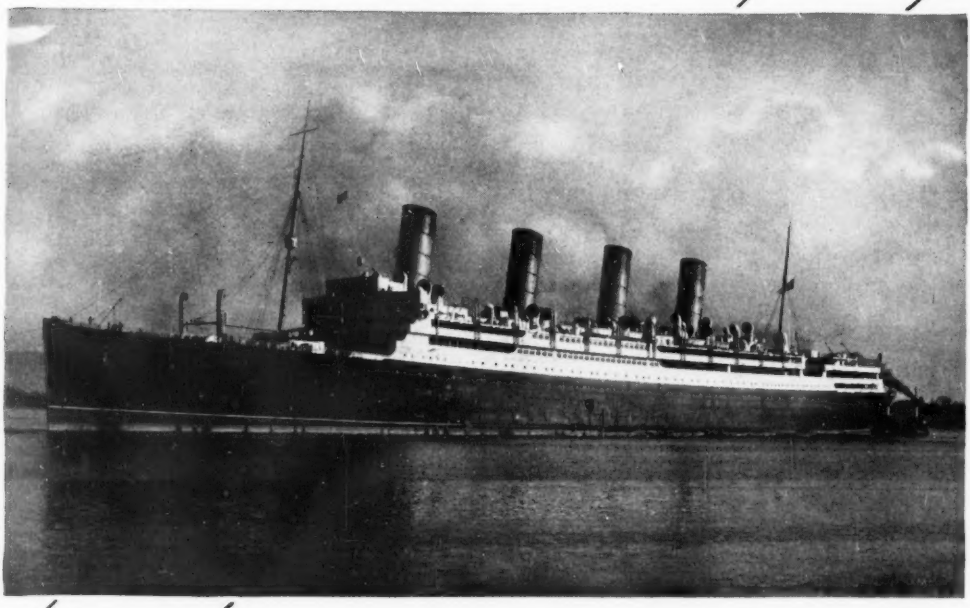


BY 'ALUMBRO' TUBES

In 1931 the main condensers of R.M.S. Aquitania were re-tubed with 'Alumbro' aluminium brass tubes manufactured by the Metals Division of I.C.I.

In 1950, when the ship was broken up, the condenser tubes were found to be in excellent condition after giving perfect service for nineteen years.

Other famous mercantile steamships fitted with 'Alumbro' aluminium brass tubes include

MAURETANIA

ORION ANDES

BALAENA

EDINBURGH CASTLE

ICI **IMPERIAL CHEMICAL INDUSTRIES LTD., LONDON, S.W.1**

M.236

Monthly Light Alloys Section

Although not standard in this country it is being used on marine structures in North America. Rivets of $\frac{3}{8}$ in. diameter or less in N5 and N6 alloys are cold driven with pneumatic hammers. Excessive driving must be avoided in order to prevent too much work-hardening, and the ideal method is to give the minimum number of blows with heavy hammers. For this reason squeeze riveting is preferred wherever possible, but otherwise hand riveting is better than pneumatic because fewer and heavier blows can be given. Rivets in N4, N5 or N6 alloy may be driven hot in order to render driving easier.

The rivet is heated to between 400 and 500 deg. C. Special rivet-heating furnaces with pyrometric control are necessary, and rivets should be brought up to temperature slowly and soaked for at least fifteen minutes to ensure uniform heating. Braziers should not be used for aluminium rivets owing to the impossibility of controlling the temperature. Steel rivets, hot driven, may be used in aluminium construction where appropriate and provided the usual precautions are taken where conditions are likely to produce bimetallic corrosion. Aluminium alloy plates are not so hard as steel and therefore need to be caulked more lightly. The rivets must be appropriately spaced and the faying surfaces should be treated with zinc chromate paint. A pitch of $3\frac{1}{2}$-4 diameters is normal. To produce an efficient caulked edge it may be necessary to reduce the distance, but in no case should this distance be less than $1\frac{1}{2}D + \frac{1}{8}$ in. (3 mm.) from the centre of the rivet. When a joint is made, whether between aluminium alloys of the same or differing compositions or between aluminium and dissimiliar metals or wood, a jointing compound should be applied liberally to the faying surfaces immediately before bolting up ready for riveting. Many proprietary brands are available.

Welding Technique

The technique of welding aluminium differs from that developed for steel because of the differences between the physical properties of the two materials. Aluminium alloys melt below red heat (in range 530-660 deg. C.), but as their thermal conductivity is about two and a half times higher that that of steel a higher heat input is necessary. The non-heat-treatable alloys (N4, 5, 6) are readily welded. Heating reduces the properties of the heat-treatable alloys; and re-heat-treatment, even if possible after welding, only partly restores the strength. Gas welding is not recommended for structural shipwork, but internal work can be gas or metal arc welded provided the necessary precautions are taken to remove flux residues. Metallic arc welding is used for aluminium, generally of 16 S.W.G. (1.6 mm.) and thicker. It has the advantage that preheating is less often required, and that welding speed is greater than with the torch. Flux is applied as a coating on the electrodes.

In recent years arc welding has been developed to the stage at which satisfactory pressure-tight welds can be made on aluminium up to 1 in. (2.54 cm.) thick, and it is a suitable process for the shipyard. This process enables neat weld beads to be formed at high speed, and as the electrode and weld pool are shrouded by an inert gas, oxides are avoided and flux is unnecessary. A bare filler rod is used, the arc being struck from a non-consumable tungsten electrode operating on alternating current—instead of direct current as is usual with coated electrodes for aluminium (Fig. 3).

"Consumable Electrode" Process

The "consumable electrode" process, developed originally in the U.S.A., uses a continuously fed wire electrode shielded by inert gas. Promising results have been obtained, both in hand and automatic welding, and the method (Fig. 4) has been applied successfully in shipyards. It is suitable for vertical and overhead welding, and operating costs are said to be lower than those of the tungsten electrode process, due to the higher welding rate. Direct current is used, and while this can be taken from an ordinary welding (drooping characteristic) generator set, better results are gained with equipment developed for the purpose. Equipment for the consumable electrode process is not yet generally available in this country. For internal sheet metal work such as air ducts, light gauge panelling, lockers, etc., resistance spot welding can be used. Recent developments in stud welding have made it possible to apply the process to aluminium. Studs up to $\frac{1}{2}$ in. diameter have been welded, and satisfactory quality is achieved using equipment identical in essentials with that for steel. This process can be satisfactorily applied to studs for fastening wood plank to aluminium decks.

Electrolytic action (galvanic corrosion) is likely to occur between dissimilar metals in contact when moisture is present, and such conditions are therefore to be avoided

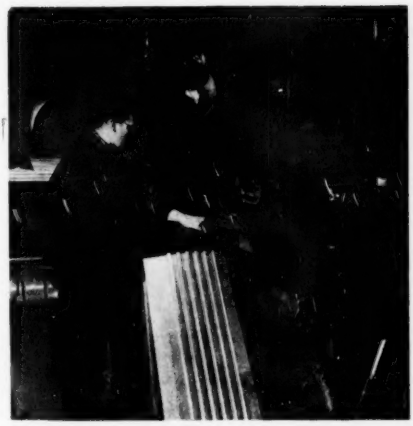


Fig. 5. Forming corrugations on a press brake

in marine work. Steel surfaces involved are preferably galvanised or sprayed with aluminium. The steel and aluminium surfaces in any case should be coated with jointing compounds and aluminium rivets and all bolts should be dipped in the compound. The assembled joint is finally painted. Another method is to paint the faying surfaces with a coat of zinc chromate primer, allow to dry, and apply a second coat immediately before assembly: the joint is finally painted. Inserts of fabric impregnated with compound, or of suitable synthetic material may be required and insulating ferrules and washers may be used on bolts; the finished joint should then be painted. Insulation is usually recommended between stainless steel and aluminium. The importance of keeping out moisture is greatest when the faying surfaces are copper (or copper alloy) and aluminium, since electrolytic action between them when moist is more severe than with aluminium/steel. Aluminium/copper joints are preferably avoided, but where they do occur, non-metallic insulating inserts are recommended. As an added precaution copper or brass may be zinc-sprayed and faying surfaces coated with zinc chromate primer. Copper nails, rivets or bolts, and also copper-bearing paints are to be avoided. Simple precautions are required, particularly with unseasoned timber, to protect the faying aluminium surface from leached wood acids and to exclude moisture. The dry timber should be thoroughly painted with, for example, a good quality bitumen paint, which may be pigmented with aluminium paste, and the aluminium surface should be treated with zinc chromate priming paint followed by bitumen paint. When lining wooden compartments, galvanised iron nails and roves should be used.

Painting Treatment

Unpainted aluminium surfaces acquire a superficial light bloom which is without detriment to the strength or durability of the material. Paint treatment is usual for exposed ship structures, and it is common practice to bring aluminium into the general painting scheme. Paint should be applied to all structural components, to welded joints, and on the faying surfaces of the joints. The following sequence of operations is recommended: Clean the surface by removing, first, all loose deposits such as oxide and grease, and second, any residual grease or oil film, using a solvent such as white spirit. Then prepare the surface for painting, either by chemical treatment, sand-blasting or wire-brushing. (Flame cleaning is not recommended.) Priming coats can then be applied, followed by intermediate and finishing coats. Special anti-fouling compounds based on organic poisons must be used, and they must be applied over suitable undercoats containing zinc or barium chromate. Standard compositions for steel hulls, containing copper or mercury compounds, must not be used as they promote rapid corrosion of aluminium hulls. There are no systematic data on the possible corrosive effects on aluminium alloy plate of the various deck compositions, but those containing magnesium chloride should not be used. Rubber-base compositions are now reported to give satisfactory adhesion.

Monthly Light Alloys Section

Empire Aluminium Development

The Choice Between North Borneo and the Gold Coast

By a Special Correspondent

WITH REPORTS flowing in from all corners of the world of continued expansion of aluminium production facilities, great interest is centred on the forthcoming release of the final report to the Gold Coast Government on the potentialities of the Volta River scheme for the development of hydro-electric power and the production of aluminium. It will be remembered that the British Aluminium Co., Ltd., in association with Aluminium Ltd., have been investigating the possibilities of setting up reduction works in Borneo and the Gold Coast. In both areas the British Aluminium Company has considerable interests, but with a project involving the expenditure of about £40,000,000 every aspect must be minutely considered.

The latest indications suggest that the Gold Coast project is favoured. Political factors play no small part in the decision, quite apart from the interest taken at Westminster. The growth of Communism in the Far East is a considerable deterrent to heavy capital investment while, although the proximity of the Malayan bauxite mines was a favourable point originally, the troubles of that country are not conducive to trade development. It is understood that survey work is continuing in North Borneo and that a possible source of bauxite would be the richly endowed islands in the vicinity. The project can, however, be viewed as a long-term development of Empire resources, rather than an immediate attempt to relieve the serious shortage of aluminium at home.

The Gold Coast Project

The Gold Coast project has many advantages. High-grade bauxite is mined on the spot. At present the ore is mined by the British Aluminium Company at Yenidin, in the Ashanti district, and sent by rail over 150 miles to the port of Takoradi, whence it is transported to the alumina factories in the United Kingdom. The resources, possibly the best in the world, together with the railway and port facilities, have been developed by the company during and since the Second World War. The object now is to establish alumina and reduction factories near the mines and ship the virgin ingot, rather than the crude ore as at present. Thus for the first time the United Kingdom will have a sterling source of aluminium ingot, apart from the small supply from the inadequate resources of the Scottish Highlands. The bottleneck of the restricted supply of Canadian ingot, at present strangling industry, will be removed and the dollar expenditure [illegible]-d.

The backbone of the development plan, involving general economic development, improvement of communications and social services, will cost £74,000,000. It is understood that the plan had a stormy passage through the Legislative Assembly, being debated clause by clause, but emerged relatively unchanged. The main bone of contention appeared to be the absence of a time clause, indicating a desire to get on with the job. This is confirmed by the separation of the Volta River scheme from the main project, both financially and by priority. The construction of a dam at Jenna has first priority. This will be 5,000 ft. long and 450 ft. high and is estimated to cost £65,000,000, a sum which, however, includes irrigation of the Accra plains and supply of electric power. The output of the associated hydro-electric power station will be in the region of 720,000 kW, of which 500,000 kW will be absorbed by the aluminium reduction works.

Harbour Facilities

The resultant increase in trade to be brought about by this scheme has raised the question of the availability of adequate harbour facilities. Two sites for development are under consideration by the Government. One is on the River Volta itself at Ada, favoured by those living in the development area. Sir William Halcrow & Partners, who were responsible for the report on the Volta scheme, recommend Tema, a village 25 miles east of Accra, where there is a good depth of water. Considerable work has already been carried out at Ada by Mr. Duncan Rose, the South African engineer, but the necessity of dredging inland for a considerable distance to enable the passage of ocean-going ships may sway the choice to Tema, where advanced surveying progresses.

The Torsion of Aluminium

A.D.A. Report on Light Alloy Sections

In addition to the series of research reports issued by the Aluminium Development Association is "The Torsion of Aluminium Alloy Structural Members" by M. S. G. Cullimore, Ph.D., and A. G. Pugsley, O.B.E., D.Sc. (Price 7s. 6d.). This work forms part of the coordinated programme of research which is going forward under the aegis of the A.D.A. at the Universities of Birmingham, Bristol and Cambridge. The report deals with the behaviour in torsion of some of the newer structural sections in aluminium, the experiments relating to sections in non-uniform as well as those in uniform torsion. In the course of the development of structural sections in aluminium alloy of sizes comparable with conventional mild steel sections, it was natural that in the first instance the new sections should follow closely the dimensions of the steel ones to which structural engineers were so well accustomed. The present British standard aluminium alloy sections of B.S.1161 still represent this stage of development. When these sections were first designed a new freedom in the forms of section available, as a result of the extrusion process, led to discussion as to whether the detailed fillet radii and tapering flange thicknesses of rolled steel sections should be slavishly copied in the extruded sections where they were not necessitated by the process; and these considerations become the more important when it is realised that the inherent stiffness of aluminium as measured by values of elastic moduli is only about one-third that of steel, so that where torsional stiffness is significant larger fillets in the new sections may give advantage.

Existing solutions from earlier work were found to be insufficiently accurate or insufficiently general for all cases arising, and further theoretical work to fill that gap is described. An important result is a set of tables of torsion constants for structural sections to B.S.1161 : 1951 covering equal and unequal angles, channels, beams and tee-bars. Thus far, the investigations refer to torsion producing small angles of twist. The theory of longitudinal stresses due to large twists and the correlation with experiment are given in the Report. The behaviour of structural sections under torques large enough to produce plasticity is also examined. A further section of work deals with sections in non-uniform torsion, the main result of which is to show that the standard theory of non-uniform torsion for these sections can be applied to all such sections with confidence, both for the prediction of twists and for the estimation of shear and longitudinal stresses. Among various results obtained during the investigations it is noted that torsional stiffness is in many cases more likely to prove important than torsional strength; hence, in addition to the current standard sections of B.S.1161 it may be desirable to add a few sections with fillet radii of about 4 ft. Such large fillets would not only help to prevent local buckling but would provide a relatively large, well stabilised area of metal to carry compression.

Aluminium davits, the first in light alloy to be passed for service in any country, are to be installed on the motorship *Marechal Joffre*, owned by the Cie. des Messageries Maritimes. To be supplied by Schat's Davits, Ltd., they will effect a weight saving of 48 per cent.

The Norwegian shipping company Fred Olsen & Company, of Oslo, has ordered aluminium rafts for installation on board its vessels. They are being built by Norsk Flyindustri, and are of two sizes, the larger size accommodating 21 men, while 10 men can be carried on the smaller-sized raft. The rafts are made of large diameter aluminium pipes divided into several airtight compartments. Within the rectangle formed by the pipes there is a wooden floor and containers for water, food and equipment. The larger-sized rafts have already been supplied to 14 ships, and there is a large number on order. Only about 600 tons of aluminium are required for the manufacture of 3,000 rafts.

MODERN MARINE CASTINGS

THE PRODUCTION OF SHIPS' PROPELLERS AND WINDOWS

BULL'S Metal & Melloid Co., Ltd., is more than half a century old, the founder, Mr. John Bull, having began as a bronze founder in London, though in 1901 the business was moved to the present site at Yoker, on Clydeside. The company made good progress and was in a position during the Second World War to supply nearly 2,000 tons of propellers for the Royal Navy, the British merchant fleet, and for Russian and other foreign ships. During the same period almost 4,000 tons of bronze rods of all sizes were manufactured. Further development has taken place in the six years 1945 to 1950, during which time over 5,000 tons of propellers, in all sizes up to a maximum of 18 tons, have been supplied, while more than 3,000 tons of other bronze forgings and castings have been made. The company now has close associations with J. Stone & Co. (Charlton), Ltd., who in February 1950 transferred their ships' window and sidelight department from Oldham to the part of the Yoker works previously devoted to rolling non-ferrous bars. Bull's Metal & Melloid, Ltd., has also been granted a licence to manufacture the Stone "Heliston" propeller, which since it was introduced in 1935 has been fitted to ships whose power totals more than 9,000,000 h.p.

During a recent inspection of the Yoker works it was possible to note the wide and varied nature of the products of the company, and an opportunity was afforded to see the cast made for the propeller illustrated in these pages being manufactured for the *Middlesex*. A unique feature of this inspection and one which aroused great interest was that two technical papers were read by Mr. E. F. J. Baugh, London representative of the company, and Mr. F. McAlister, technical director of the Charlton and Yoker companies. The papers, abstracts from which are reproduced in these pages, were of great assistance in appreciating the processes of manufacture as well as the technical problems involved in design.

Paper No. I—Evolution of the Modern Ship's Superstructure. By E. F. J. Baugh

Over the past 56 years much attention has been paid to the building up of the special range of windows to meet the requirements, however stringent, of any shipowner or shipbuilder, with the result that today the range is fully comprehensive. Whenever possible an effort is made by window design staff to examine the profile and deck plan of a new ship in order that the most suitable windows may be recommended for every position. There is no "rule of thumb" method governing these decisions and the window requirements of each ship should be treated on its individual merits, having particular regard to:—

(1) The class of ship;
(2) the type of weather likely to be experienced under service conditions;
(3) height from load waterline;
(4) degree of protection offered by, for instance, decks overhead, side-screens, whether facing forward or aft, etc.;
(5) maintenance, etc.

As long ago as 1895 J. Stone & Co. formed a department to examine problems affecting ships' windows and sidelights and set about the preparation of designs suited to the various positions in which windows should be fitted. Within a few months mechanically operated brass-framed prototype windows were under test, forerunners of many thousands of windows of all types supplied during the ensuing half-century. The "Stone" type W.1 rack and pinion operated watertight product, with its ease of operation and wedging device for ensuring watertightness, was put to its most severe test when fitted in the wardroom of Captain Scott's *Discovery*. This proved to be so satisfactory that even today, without major change in design, it is being fitted in important new tonnage.

In 1911 Stone's designed and supplied the mechanically operated windows for the public rooms of the *Mauretania*. In all some 20 designs were approved, the largest of which had an overall clearlight size of 8 ft. in height by 5 ft. in width. Since these windows were fitted in the most exposed positions and had to be capable of withstanding North Atlantic conditions, the brass main frame scantlings and operating gear were of unusually robust construction. Some 25 years later when this ship was broken up these windows were found to be mechanically perfect and in as good condition as when originally fitted. As the years went by the range of designs was extended and new ideas and techniques were put into practice. A so-called frameless window, comprising a frameless glass sliding in waterproof felt or velvet-covered rubber channel section housed in a brass frame, made its appearance as a contribution towards the call for windows of lighter construction. Extruded brass of specially designed section took the place of cast frames in many instances, thus opening up a new avenue for fabrication by welding, with the added advantage of being suitable for production in a variety of shapes and clearlight sizes without the cost of expensive pattern equipment. The "Fusee" spring drum became the recognised method of balancing the windows and imparting to them "quick-lifting" qualities. Insistence by owners that the opening and closing of windows should be under the jurisdiction of stewards, led to the development of the frameless glass rack and pinion operated window with extruded main frame in 1931.

Development of New Designs

An example of cooperation between shipowners and the window department was shown in 1934 when the Orient Line became interested in equipping a considerable part of their ships' side cabin accommodation with windows. Since those windows were to take the place of sidelights it was necessary to seek M.O.T. approval of the design and this approval was finally obtained at the end of 1934. The window suggested was a vertical sliding type, balanced by means of two "Fusee" spring drums, complete with wedging mechanism for obtaining watertightness, and fitted with additional clearlight in the form of either a fixed or hinging ventilator top. The first batch of these windows was fitted in the passenger ship *Orion* in the deck immediately below the first tier or superstructure and proved to be completely successful. Since then, a number of important ships have had this type of window installed and there are in hand considerable orders for new tonnage in course of construction.

With the approach of the Second World War the resources of the window department gradually came to be concentrated on the design and development of special types of windows for H.M. ships, and up to 1945 some 8,000 windows were supplied for the naval construction programme. For of the *King George V* class of capital ships, the *Illustrious* class of aircraft carriers, the *Southampton*, *Uganda* and *Dido* class cruisers, the *Abdiel* class minelayers, for depot ships, destroyers and other warships' windows were specially designed and manufactured by the company.

The latest trends of naval architecture require the use of even more glass in ship construction, and several new types of windows have been evolved. The first of these was the "Broadway" window which in its complete form, comprising fixed top and bottom panels and central sliding panel,

"Wide-Vista" windows in the wheelhouse of the Orient liner "Oronsay"

measured six feet high by over two feet broad in clearlight. The ideal for promenade deck side screens or observation lounges, with the bottom of the window only 9 in. to 12 in. above deck level, the "Broadway" enabled passengers to recline in their deck chairs and still view the surrounding scenery when cruising. Greater vision in the fronts of wheelhouses can be provided by the "Wide Vista" combined fixed and horizontal sliding window which is now in production. This extruded brass fabricated window with clearlight of the order of 2 ft. 6 in. high by 7 ft. wide has been fitted in several vessels, the most notable perhaps being the Orient Line's *Oronsay* where seven "Wide Vistas" face forward from the wheelhouse. Another interesting development is the officially designated type W.110, more generally referred to as the "Flip-Flap." This is another illustration of close cooperation between shipowner and window designer. The "Flip-Flap" is specially designed to M.O.T. requirements for fitting in ships' side accommodation, particularly in vessels plying in the tropics. Composed of two glass doors divided by a horizontal central bar and hinged one on either side of the main frame, this window offers the passenger a variety of open positions to obtain the maximum of fresh air and ventilation.

Seven tanker companies are now arranging to fit windows in lieu of sidelights in the crews' accommodation in the superstructure. The type of window chosen is generally that having a fixed lower portion and hinged ventilator top with the ventilator portion of nine inches depth to allow the window to be used for escape purposes. As regards sidelights, the policy in the past has been to concentrate on special types, the principal being known as types S.38 and S.59. The first of these with wedge fastening mechanism has dispensed with bow handle fasteners, allowing sealing to be effected by the turning of one T. handle operating a ring round the glass door, this ring engaging simultaneously in five wedges on the main frame. The second type is similar in general construction to the ordinary pattern sidelight, but without having the projecting lugs on the glass holder. Instead, direct pressure clips of patent design ensure a more efficient joint by bearing on the rim of the glass holder directly over the line of contact with the rubber joint ring, no pressure being exerted on the glass itself.

The increasing use of light alloys in ship construction makes it certain that further advances will be made in the years to come in marine directions hitherto thought impossible. Windows of light alloy construction have already been fitted extensively in certain classes of ships with successful results, but extreme care has to be observed in ensuring proper insulation between steel plating and the alloy frames, otherwise serious deterioration through electrolytic action may take place. Over the course of several years, experimental sidelights of the Stone S.38 type with light alloy frames were subjected to seagoing tests in various positions of the hull of a large passenger vessel, and periodic examinations indicate that the alloy, with suitable insulation, has stood up well to the conditions. Glass panes up to 36 in. by 48 in. or 12 sq. ft. are now used with thicknesses from ½ in. in one case up to 1½ in. Armourplate glass which alone will stand up to the buffeting and shocks of an angry sea is fitted extensively, and on naval vessels is generally to be found laminated, splinter-proof armoured glass. The showroom at Yoker, based on the layout of a modern passenger liner's wheelhouse, is unique of its kind.

Paper No. 2—Propellers at Yoker. By F. McAlister

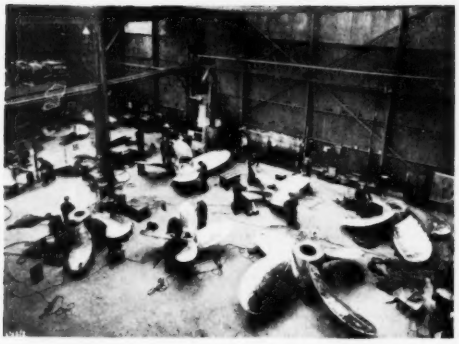
The middle of the nineteenth century saw the general transition in ship construction from wood to iron and the general adoption of the screw propeller for marine propulsion. During these early years propellers were made of cast iron or cast steel and the larger propellers were very often of the adjustable blade type rather than of the solid type. During the last quarter of that century bronze was introduced as a more suitable metal for propeller manufacture and was immediately successful. Coupled with the outstanding qualities of ease of casting, soundness of metal, freedom from casting defects, accuracy of pitch and ease in repair were the added features of freedom from erosion and corrosion. It is safe to say, therefore, that in the development of ships, one of the most important contributions has been made by the bronze propeller industry and in this country today is centred the major bronze propeller industry of the world.

Propellers, although it is a custom of the trade to refer to them as "bronze" are in reality made from an alloy of copper and zinc and should, more correctly, be called high tensile strength brass propellers. The normal composition of propeller bronze is 57 per cent copper, 40 per cent zinc, the remaining 3 per cent comprising tin, iron, aluminium, manganese, etc. This alloy differs materially from other bronzes and brasses and virtually the only experts in this particular propeller bronze are contained within the orbit of the propeller manufacturers. Each manufacturer, however, has his own particular composition and methods of ingotting and Bull's have developed their own characteristic bronze long known in the trade as "Bull's Metal." The principal characteristics of the metal are a tensile strength of 32-34 tons per sq. inch and an elongation of 20 per cent which satisfactorily comply with any of the registration societies' requirements. In the early days of this company the Clyde market and the type of propeller best suited for manufacture limited the company to an annual output of about 200/300 tons of finished propellers per annum. In 1938 there arose the national necessity of deploying specialised manufacturing resources in widely separated districts and arrangements were made to improve the productive capacity of the works to about 400 tons per annum.

The principal requirements in a bronze propeller, in design, material and workmanship may be summarised into ten main headings.

(1) The propeller should absorb the required power at the designed revolutions.
(2) It should deliver the maximum possible thrust in this condition.
(3) It should be free from vibration, erosion and singing and strong enough for the intended duty.
(4) The casting should be sound and free from blowholes and other defects.
(5) The metal should be of high tensile strength and good ductility.
(6) The metal should be easily repairable.
(7) It should faithfully reproduce the design in every detail.
(8) The blades should be in phase and track and perfectly balanced.
(9) It should be highly polished to give highest efficiency.
(10) The preceding nine points should be carried out in a reliable manner such that the finished product is durable and outlives the ship.

A general view of the machine shop for producing Bull's ships' windows



A machined propeller is chipped to shape by pneumatic hammers, then ground and polished

It is now over a century since the first successful propeller was invented and in the 1840s one of the most popular evening entertainments in London was to embark at Paddington on the Regents Park Canal in Francis Smith's barge propelled by the novel screw propeller. It was Lanchester, who, so long ago as 1897 first suggested taking account of the vortex motion in the slip stream; whose Automobile Association paper of 1915 completely escaped the critics; whose ideas were studied deeply by aerodynamic students on the Continent; it is Lanchester to whom we should, today, give all credit for the far reaching thoughts which have fashioned so much change and progress, certainly in marine propulsion. The early conception of a propeller was that of an inclined blade with a face of nearly mathematical certainty pushing backwards a large volume of water in the form of a rotating column and the reaction pushing the ship forward. Today we view the matter as an inclined blade with a particular rounded back of nearly mathematical certainty developing intense suctions or negative pressures over the back thus sucking the ship forward. At least two-thirds if not more of the total thrust is developed as negative pressures on the back of the propeller blade.

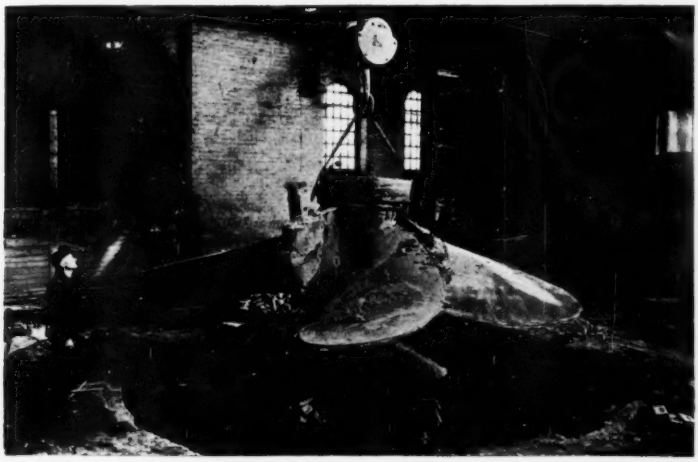
In design, therefore, after fixing the limiting or best diameter, one has to ensure that at each radius the section through the propeller blade meets the water at an angle which will produce the necessary lift and thrust; that the water meets the blade without shock; that in passing over the back of the blade the negative pressures are not excessive and do not break down and enter cavitation; that the water leaves the blade without shock. If the angle of the blade to the water is too small the engine revolutions are too high; if the angle is too great the revolutions are low and the engine overloaded. If the water meets the leading edge at too small an angle, face cavitation, loss of efficiency and erosion of the blade face may occur; at too large an angle back cavitation, loss of efficiency and erosion of the blade back may occur. If the blade width is too small the intensity of negative pressure may rise and enter cavitation when vibration, loss of efficiency and erosion may occur. If the change of curvature over the blade back is too rapid the water may be unable to follow the changing shape and again cavitation, erosion and vibration may follow. If the thickness of the section is not sufficient to withstand the water forces then the propeller will bend or possibly break.

Conditions, of course, vary. In a slow speed low power propeller little regard may be paid to the foregoing and equally efficient designs can be produced which differ materially in detail. As powers and speeds increase conditions become much more circumscribing and if experience is not available in guiding the designer then, from the propeller point of view, the most disastrous things may happen. The pitfalls are well known and with experience and knowledge can be avoided in new designs but only if the experience is understood and analysed correctly. As an illustration of this I can only repeat what I have written in another place. In the case of the *Queen Elizabeth* one of the original 1940 Helistons was damaged during the war and replaced; the remaining three of the original 1940 Helistons are still in service today after eleven years of arduous service.

Increase in Size of Propellers

One interesting fact emerging out of our work is the continuous increase in size of propellers principally owing to the development in large tankers, the demand for speed and the higher efficiency of the single screw vessel. For many years the highest powered single screw vessels on record were the Cunard *Etruria* and *Umbria* built in 1885 with 14,500 i.h.p. and a speed of 19 knots. Subsequent development of liners lay along twin screw, then triple and finally quadruple screw. In the middle thirties enterprising shipowners in this country, U.S.A. and Japan concentrated on high speed single screw cargo liners of about 9,000 h.p. and 15 to 20 knots speed. The war brought a suspension of this development, but since 1945 12,000 and 14,000 h.p. single-screw cargo ships and tankers have been developed, principally in this country. The impact on propeller design and production is profound. The problems of vibration and erosion are intensified and the weight of a modern propeller for 14,000 h.p. and 100 revolutions now approaches 30 tons.

It is not surprising therefore to find that our future plans for the new foundry are based on the efficient production of this and even larger and heavier propellers. We are also studying intensely the metallurgical problems of propeller alloys of greater tensile strength and lighter weight. Such metals will permit thinner blade sections thus helping to avoid erosion problems and offering greater efficiency; they will reduce the total weight of the propeller thus reducing the moment of inertia and assisting in the solution of shafting difficulties, and it is hoped that this step forward will be taken without affecting any of the qualities which have so long distinguished the present day bronze alloys.



A 17-tons manganese bronze propeller, with a diameter of 19 ft., being hoisted from the casting pit at the Yoker works of Bull's Metal & Melloid Co., Ltd.

ROUND THE SHIPYARDS

Work in Progress on Merseyside

By THE SHIPPING WORLD'S Own Correspondent

"THE Merseyside shipbuilding industry is enjoying an unparalleled period of activity. Most of the work, civilian contracts, is mainly for tankers, and with Admiralty work under the defence programme, is sufficient for the next four or five years. More than 1,500 men are engaged on naval refits, and the winter overhaul of Atlantic liners has started." This was reported at a meeting of the North-Western Regional Board for Industry at the beginning of November and may be regarded as a fair summing up of the shipbuilding and repairing situation in the Merseyside area. Whether activity is, in fact, "unparalleled" is perhaps open to doubt, particularly insofar as the shiprepairing side is concerned, but there is little doubt that things are a good deal better than they were two years ago.

On the shipbuilding side there were one or two events of interest during the past month. It began, appropriately enough, with a launch when, on November 1, the single-screw cargo steamer *Romney*, for the Lamport & Holt Line, Ltd., took the water from the shipyard of Cammell Laird & Co., Ltd. The *Romney*, a general cargo ship of 10,300 tons deadweight, has been designed for the Lamport & Holt trade between this country and the East coast of South America. She is one of five ships being built for the company in various yards and incidentally is the first ship Cammell Laird has built for the Lamport & Holt Line. Commenting on the costs problem after the launch, Mr. R. W. Johnson, managing director of the builders, said: "We as builders, although severely handicapped by shortages of materials, do our utmost to try to help the shipowner. The only way we can do this is to try to build the ships quickly and efficiently and in this way we contrive to help keep costs down."

On Friday last (November 30) another launch took place from the yard, when the 18,000-tons tanker *Eva Peron* was waterborne. The last of four tankers ordered from Cammell Laird by the Yacimientos Petroliferos Fiscales, Buenos Aires, the *Eva Peron* will have a length of 565 ft. 9 in., a moulded breadth of 71 ft. and a moulded depth of 39 ft. Her main machinery will consist of a set of double-reduction geared turbines.

"City of Brisbane" on Trials

During the month the 12,000-tons cargo liner *City of Brisbane*, built for the Ellerman & Bucknall Steamship Co., Ltd., was completed by the Birkenhead firm and left for trials on the Clyde. The fifth ship to be completed by Cammell Laird this year, the *City of Brisbane* has been designed to carry general and refrigerated cargo with provision for chilled beef, and is now employed on the Australian trade. Early in December the sixth new ship to be completed this year is expected to leave for her trials. She is the 7,100-tons passenger and cargo liner *Hildebrand*, building for the Booth Line and launched on July 20 last.

The most important refit job on which Cammell Laird's are engaged at the present time is that of the Shaw Savill liner *Gothic*, which is being prepared for the voyage to Australia and New Zealand to be made by Princess Elizabeth and the Duke of Edinburgh early next year. About 700 men are engaged on this contract, on which good progress is being made. It is scheduled to be completed about December 15. The *Gothic* is to carry cargo on her outward voyage and a temporary halt was called to her fitting out when she moved across the river to the Gladstone Dock to load her valuable export shipments, totalling some 9,000 tons.

On the domestic side an interesting announcement made during the month was that Mr. John Chadwick Mather had been appointed chairman of Cammell Laird & Co., Ltd., in succession to the late Sir Robert Johnson. Mr. Mather joined the board last February.

The main feature of the shiprepairing industry during the month has been the beginning of the Atlantic liner overhaul season. This was marked by the arrival of the 34,000-tons liner *Caronia* from Southampton early in the month—her fourth visit to the Mersey since she was completed in 1948. On arrival, the *Caronia* entered the Gladstone Graving Dock and the task of overhaul has been carried out by Harland & Wolff, Ltd. She is due to leave the Mersey for Southampton on December 7. The liner overhaul season will not be quite so busy as last year, since two ships, the *Scythia* and *Samaria*, are to be overhauled at Southampton, while a third, the *Media*, is to go to the Clyde.

John I. Thornycroft & Co., Ltd.

50th Annual Meeting

THE 50th annual general meeting of John I. Thornycroft & Co., Ltd., was held in London on November 28, Sir John E. Thornycroft, K.B.E. (governing director and chairman), presiding. The following is an extract from his circulated statement:—

All sections of the company are participating in the rearmament programme, which necessitates a considerable outlay in improvements and replacements of building and plant. It has also been necessary to invest further sums in our overseas subsidiaries and branches in order to expand and develop export sales. The combined commitments will draw heavily on the cash resources of the company.

Engineer Vice-Admiral Sir Reginald W. Skelton, K.C.B., C.B.E., D.S.O., in proposing the re-election of Sir John E. Thornycroft, K.B.E., as governing director of the company, said: If we in this country are to maintain a higher standard of living than people in other countries, it can only be done by greater productive efficiency.

Regarding profits paid to shareholders, over fifty years this has represented 7d. net in the pound on the wages paid, and the Exchequer has taken 3½d. in the pound. A reasonable return must be made to those individuals investing their savings in a business, or otherwise new capital—the result of savings—will not be available to finance the provision of new plant, the cash for stocks and work in progress.

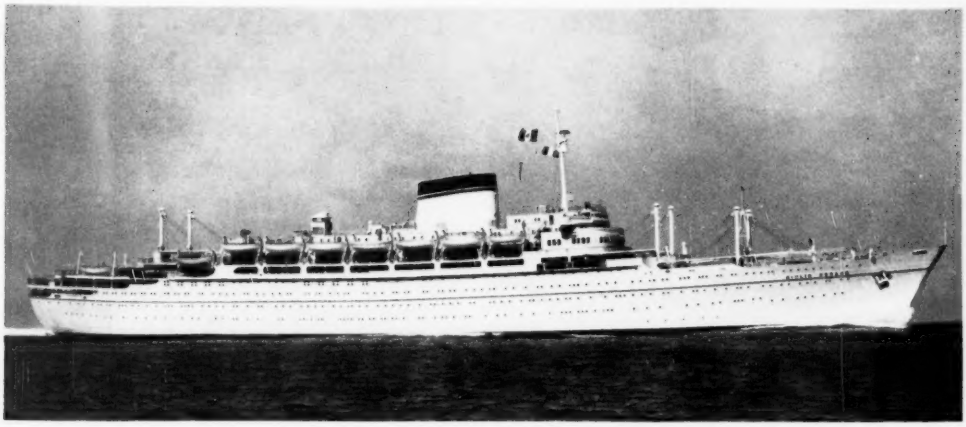
The proposal was approved. At a subsequent extraordinary general meeting the authorised capital was increased to £1,950,000 by the creation of 900,000 new ordinary shares of £1 each.

DANISH SHIPPING AND SHIPBUILDING

(*Continued from page* 397)

steamer *Svend Pii*, built in 1923, to Sweden, has ordered a 4,000 tons d.w. motor vessel at the Elsinore shipyard. She is to be delivered in 1953 and her 2,700 i.h.p. B. & W. diesel will give her a speed of 13 knots. The Steamship Company Jutlandia (Jens Toft) has ordered a 5,500 tons d.w. motorship at Rickmers Werft, Bremerhaven; and Nakskov Skibsværft has received an order from the Cie. Maritime Belge for a 9,500 tons d.w. diesel cargo liner.

On November 16 the Elsinore shipyard launched the motorship *Delos* for Otto Hillerstrom, of Helsingborg. The vessel is of 6,500 tons d.w. with tweendecks, and has a capacity of 442,500 cu. ft. grain, including 33,300 cu. ft. of refrigerated space. Her machinery consists of a 9-cylinder two-stroke single-acting B. & W. diesel which produces 6,750 i.h.p. On November 20 the Nobiskrug yard at Rendsburg launched a motor vessel building to the order of Mr. A. E. Sorensen, of Svendborg, after drawings by Martin Nielsen, of Copenhagen. The same yard is building two similar vessels for other Danish owners. The vessels are of 500 tons gross and 900 tons deadweight approximately. On October 24, Burmeister & Wain's yard at Copenhagen delivered the motor cargo vessel *Jeppesen Mærsk* to A. P. Moller, Copenhagen. The vessel is of 9,625 tons d.w., has a capacity of 635,550 cu. ft.



ITALIAN LINER "GIULIO CESARE"

LARGEST POSTWAR ITALIAN LINER FOR SOUTH AMERICAN SERVICE

THE twin-screw motorship *Giulio Cesare*, about 25,000 tons gross, is the first of two new passenger liners designed for the Italy-South American service of the Italia Line. Built by the Cantieri Riuniti dell' Adriatico, Monfalcone, she sailed from Naples on October 27 for Genoa, Villefranche, Barcelona, Dakar, Rio de Janeiro, Santos, Montevideo and Buenos Aires. Her sister ship *Augustus*, now fitting out by the same builders at Trieste, is scheduled to begin her maiden voyage on this route next spring. The *Giulio Cesare* is a notable vessel from many points of view, among them the fact that she is driven by the largest Fiat diesel engines ever built, each having a normal output of 13,000 horsepower. They give a service speed of 21 knots, but this was exceeded on trials. Her displacement at the fully laden draught of 28 ft. is 27,300 tons. On trials, with a displacement of 23,000 tons, an average speed of 23.384 knots was attained.

The *Giulio Cesare*, as the photograph above shows, is a handsome vessel built on modern lines, with bulbous bow and raked stem, cruiser stern, rounded superstructure, single mast and large funnel. The bridge and wheelhouse are constructed of aluminium alloy. The maximum beam falls about 3 ft. below the full load waterline, and the exaggerated tumblehome is even more pronounced than in the Dutch passenger liner *Oranje*.

The vessel has been built to comply with the requirements of the Registro Navale Italiano, Lloyd's Register of Shipping and the American Bureau of Shipping. Her principal particulars are as follows:—

Length overall	682 ft. 5 in.
Length b.p.	617 ft.
Length on line of maximum immersion	630 ft. 6 in.
Breadth moulded	89 ft. 2 in.
Depth to upper deck	49 ft. 3 in.
Draught at full load	27 ft. 10 in.
Corresponding displacement	27,300 tons
Gross tonnage (about)	25,000 tons
General cargo capacity	5,850 cu. m.
Insulated	1,150 cu. m.
Passengers:	
First class	118
Cabin class	196
Tourist class	788
	1,102
Crew	591
Complement	1,693
Service speed	21 knots
Service h.p.	26,000 h.p.
Maximum h.p.	37,000 h.p.

The passenger accommodation, as the accompanying photographs show, is carried out in the modern manner, and is air conditioned throughout the ship. The first-class accommodation consists of single and two-berth cabins, all with private bath and telephone, and mostly on the outside of the ship. The first-class quarters also include four *de luxe* apartments, each consisting of stateroom, day room, bath room, ladies' dressing room and baggage room. The cabin-class accommodation consists of two-, three- and four-berth cabins, each with either a private bath or a shower. The tourist-class cabins have two or four berths, with showers distributed through the accommodation.

In all there are 14 first-class public rooms, with nine for the cabin class and eight for the tourist class. All three classes have open air swimming pools and lidos, and ample promenade deck space, both open and enclosed. There are four cinemas, one of which is in the open air. The ship has a hospital and a chapel, and other services for passengers include tourist offices, banks and shops. A garage for passengers' cars has direct access to the quayside through side doors.

The Cargocaire system of hold ventilation has been installed in Nos. 1 and 2 holds and tweendecks, and

Three-berth cabin-class bedroom

PASSENGER ACCOMMODATION IN THE "GIULIO CESARE"

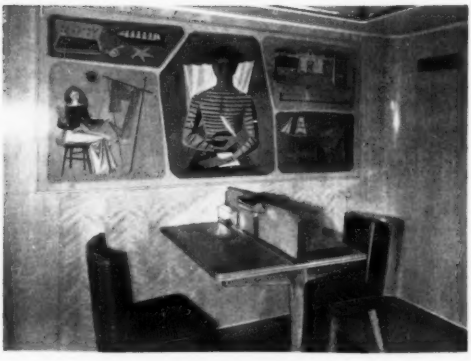
The card room

First-class dining saloon

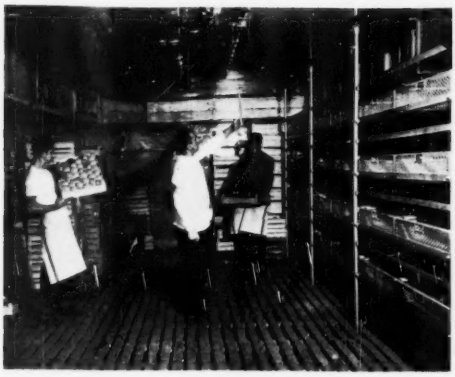
First-class lounge

First-class two-berth cabin

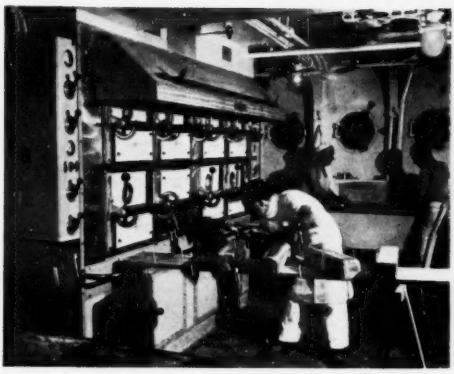
Part of tourist-class lounge



Corner of cabin-class writing room



The cold Store



The bakery

this is the first Italian vessel to be fitted with this system. The cargo space amounts to a total of 7,000 cu. metres, of which 1,150 cu. metres are insulated. Cargo is handled by twenty 5-tons derricks and one of 30 tons, served by electric winches.

The navigational equipment includes radar, echo sounding equipment, and gyrocompass with gyro-pilot. Sound reproduction equipment is fitted throughout the ship. The fire alarm and extinguishing system is completely automatic. There are 17 Fleming type lifeboats and two motor lifeboats, with a total capacity of 1,764 persons.

The main propelling machinery, constructed in the Fiat works at Turin, and the largest engines yet built there, consists of two 12-cylinder engines of double-acting, two-stroke type, direct coupled to twin shafts. At their normal service output of 13,000 h.p. each, they develop over 1,000 h.p. per cylinder. The cylinders are 650 mm. in diameter, with a stroke of 960 mm. The engines are 58 ft. in length, and 26 ft. high. They develop their normal service horsepower at 160 r.p.m. Their maximum horsepower is 18,500 each, a total of 37,000 h.p., at 192 r.p.m. There are two auxiliary oil-burning boilers in the engine room. The main generating plant consists of a group of five diesel generators, each of 750 kW, supplying current at 200 volts. In addition, there is a turbo-dynamo of 450 kW.

RECENT PUBLICATIONS

The report of the Anglo-American Council on Productivity's team dealing with "Metal Finishing" has now been published (price, 3s. 6d.).

Surveys of economic and commercial conditions in Nicaragua and El Salvador have been published by H.M. Stationery Office (price, 1s. 3d. and 1s. 6d. respectively).

A recent issue of *Welding Research*, journal of the British Welding Research Association, contained two interesting articles on the welding of light alloys. One was a report, "Development of a 600-ampere Argon Arc Torch for the Manual Welding of thick Aluminium Alloy Plate," and the other was a review of "Machine Characteristics for Flash Welding Aluminium Alloys."

No. 155 of *Crossley Chronicles*, published by Crossley Bros., Ltd., Manchester, is devoted to the Hong Kong and Yaumati ferries, described as the largest ferry fleet in the British Commonwealth. During 1950 they carried nearly 70,000,000 passengers and over 800,000 vehicles. Nearly 30 Crossley diesel engines, totalling about 10,000 b.h.p., have been supplied to these ferries for propulsion purposes.

The Northern Aluminium Co., Ltd., has produced an illustrated booklet describing the company's foundry and forge at Handsworth, Birmingham. The Handsworth foundry was originally built in 1926, a forge being added in 1936 and 1937. Continual improvements and modernisation have taken place since the opening of the factory and during the Second World War monthly production figures of 400 tons of forgings and 150 tons of castings were attained.

The current issue of the British Iron & Federations's *Monthly Statistical Bulletin* contains a note giving up to date information on American developments, raw material and price trends, including a comparison of British and American steel prices. It also contains a longer article on "Efficiency in Steel Consumption," which is particularly interesting in view of the Productivity Team Report on "Saving Scarce Materials."

THE ADDRESS of the London office of Harbormaster, Ltd., is now 42 Walmer Road, London, W.10. (Telephone: Ladbroke 1221.)

BOOK REVIEWS

Bristol, by Tudor Edwards. (B. T. Batsford, Ltd., 15 North Audley Street, London, W.1. Price, 9s. 6d.)

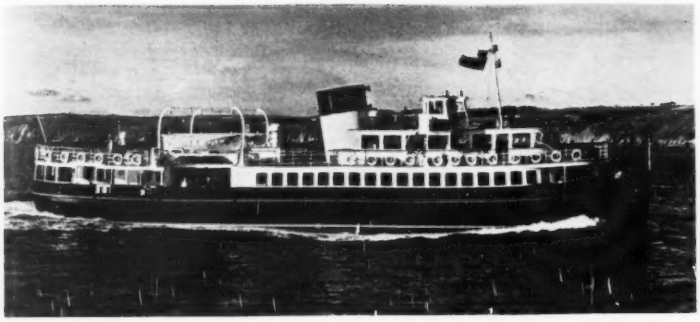
The latest addition to the well-known "British Cities" series deals with a city which has a long connection with shipping and maritime history generally. Mr. Edwards writes of the historic, social, commercial and cultural aspects of Bristol, but his main preoccupation, inevitably, is with the architectural delights of the city and its surroundings. These are illustrated with some 50 magnificent photographs.

Die Grundlagen der Tarifpolitik fur den Nordostseekanal (*The Bases of Tariff Policy for the Kiel Canal*), by Dr. Bruno Arnold. (University of Kiel, Dusternbrooker Weg 120, Kiel. Price, DM 5.)

This is volume 20 in a series of research reports of the Institute for World Economy at Kiel University. The author considers whether the inadequacy of the present Kiel Canal tariff could be remedied by a tariff of dues commensurate with present day conditions. Shipping between the North Sea and the Baltic has the choice of circumnavigating Skagen or using the canal, and the decisive factor in the choice is the advantage to be gained by taking either of these routes. Suggestions are made for the formulation of a new tariff based on gross register instead of net register tonnage, *inter alia*, and that a unified rate should include the canal fee proper, canal pilotage and taxation.

Surface Defects in Ingots and their Products (*Recommended Definitions*) (Special Report No. 44, published by the Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1. Price, 25s.; 15s. to members).

This report (with 105 illustrations) has been prepared by the Ingot Surface Defects Sub-Committee (Steelmaking Division) of the British Iron & Steel Research Association. The Committee's terms of reference were "to examine data on, and to investigate the causes of, ingot surface defects and their influence on the semi-finished and finished product." The value of uniformity in naming ingot defects, and of a systematic approach to a diagnosis of their causes, was soon realised. This report therefore defines and illustrates the commonly occurring defects, as well as suggesting their causes. It is important, therefore, not only to steelmakers but also to users of their products, including shipbuilders.

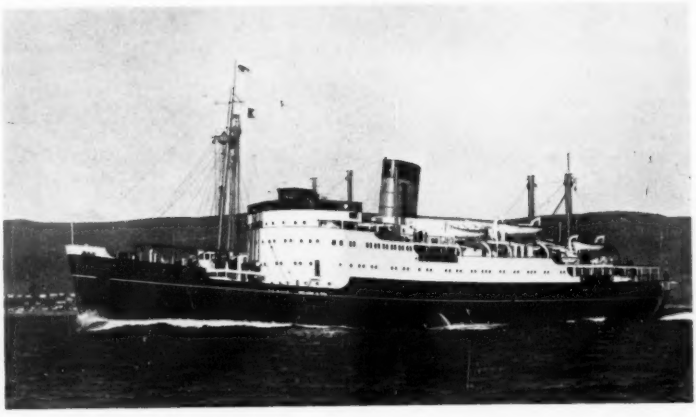


Passenger Ferry for Wallasey

Of 645 tons gross, the new passenger ferry *Leasowe* has been built at Dartmouth by Philip & Son, Ltd., for the Corporation of Wallasey. She has been designed for the regular ferry service between Seacombe and Liverpool and can accommodate 1,600 passengers. While on cruising service, however, she will carry 700 passengers. Her principal dimensions are 145 ft. length b.p., 34 ft. breadth moulded and 12 ft. 3 in. depth moulded. There are twin screws, each shaft being driven by an 8-cylinder two-stroke diesel engine supplied by Crossley Brothers, Ltd. These engines develop a total of 1,200 b.h.p. in service at 330 r.p.m. A mean speed of 13¼ knots was attained on trials

Passenger and Cargo Ship "Tofua"

Designed for the carriage of passengers and refrigerated, cooled and general cargoes in the owners' Pacific Islands-New Zealand services, the twin-screw motorship *Tofua* has been completed by William Denny & Brothers, Ltd., for the Union Steam Ship Company of New Zealand, Ltd. Of about 5,000 tons gross, she carries about 3,800 tons d.w. on a mean draught of 21 ft. 6 in. She has dimensions of 390 ft. 6 in. length o.a., 54 ft. 6 in. breadth moulded and 26 ft. 6 in. depth moulded to B deck. There is accommodation for 73 passengers in first-class cabins, while 200 native deck passengers can be carried on coasting voyages. The cargo is carried in five holds and tweendecks. Her twin screws are driven by two 7-cylinder two-stroke single-acting Sulzer-type diesel engines. A speed of over 16 knots was attained on trials



Argentine Passenger Liner "Alberto Dodero"

The twin-screw passenger liner *Alberto Dodero* has been delivered to the Compania Argentina de Navegacion Dodero by the N.V. Koninklijke Maatschappij "De Schelde," Flushing. The vessel, a motorship, has a gross tonnage of 11,521 and a summer draught to underside of keelplate of 25 ft. 11 in. Her principal dimensions are 520 ft. 3 in. length o.a., 496 ft. 5 in. on load waterline, 480 ft. b.p., 64 ft. breadth moulded and 38 ft. depth moulded to upper (D) deck. Accommodation is provided for 738 passengers. The propelling machinery consists of two 10-cylinder two-stroke single-acting Sulzer-type diesel engines supplied by the shipbuilders. Developing a total of 10,000 s.h.p., these engines provide a service speed of 17 knots. On trials, in ballast condition, the vessel attained a speed of 19 knots over the measured mile

NEW CONTRACTS

Yards in Great Britain and Northern Ireland

Shipowners	No. of Ships	Type	Approximate Tonnages: Gross	Approximate Tonnages: Deadweight	Dimensions (ft.)	Speed (knots)	Propelling Machinery	Total h.p.	Engine Builders	Shipbuilders
C. Ostberg, Oslo	1	Cargo	—	10,000	—	—	Doxford diesel	—	N.E. Marine	Wm. Pickersgill
P. Lodding, Oslo	1	Cargo	—	10,000	—	—	Doxford diesel	—	N.E. Marine	Wm. Pickersgill
Alvion S.S. Corpn., Panama	1	Cargo	—	10,000	—	—	B. & W. diesel	—	Harland & Wolff	Wm. Pickersgill
A/S Mabella, Drammen	1	Cargo	—	3,500	—	12	Tr.-exp. steam	—	Shipbuilders	Wm. Gray
Bruusgaard, Kiosterud & Co., Drammen	1	Tanker	—	16,400	—	14.5	Doxford diesel	—	—	Blythswood S.B.
Westfal-Larsen & Co., Bergen	2	Tankers	—	16,500 (each)	—	—	Diesel	—	—	Lithgows
Ellerman's Wilson Line	2	Cargo	—	2,500 (each)	—	13-13.5	Tr.-exp. steam, B. & W. turbine	—	Swan, Hunter & Wigham Richardson	Henry Robb
	1	Cargo	—	1,600						
Aden Port Trust	1	Sea-going tug		770 (disp.)	120 b.p. - 33 - 14.75	11.5	Tw.-scr. tr.-exp. steam	1,280	Shipbuilders	Ferguson Bros. (Port Glasgow)
Aden Port Trust	1	Tug		65 (disp.)	55 b.p. - 15 - 7.875	9	Lister diesel	250	—	Wm. Weatherhead & Sons (sub-contracted from Fairmile Construction Co.)
Victoria Shipping Co.	1	Tanker	—	24,750	—	—	Dble.-red. geared turbine	—	—	Furness S.B.
	1	Tanker	—	32,500	—	—	Dble.-red. geared turbine	—	—	
British Oil Shipping Co.	1	Tanker	—	16,300	—	—	Doxford diesel	—	N.E. Marine	Furness S.B.
Ottawa S.S. Co.	1	Tanker	—	24,750	—	—	Dble.-red. geared turbine	—	—	Furness S.B.

Commonwealth and Foreign Yards

Partenreederei MS Neubau 258, Emden	1	Cargo	6,100	10,000	—	13.5	M.A.N. diesel	4,000	—	Nordseewerke, Emden
Erich Ahrens, Hamburg	1	Cargo	1,000	1,500	—	11	M.A.K. diesel	1,000	—	Schiffbau-Ges. Unterweser, Bremerhaven
Egon Oldendorff, Lubeck	1	Cargo	1,400	2,500	—	12	Two M.A.K. diesels	1,600		
Egon Oldendorff	1	Cargo	—	4,200	—	13	Diesel	2,700	—	Lubecker Masch.-Ges.
Breyer & Co., Hamburg	1	Cargo	550	1,100	214.3 o.a.	11.5	M.A.K. diesel	1,100	—	Schiffs. Fritz Frank, Hamburg-Wilhelmsburg
Breyer & Co., Hamburg	1	Cargo*	550	1,100	214.3 o.a.	11.5	M.A.K. diesel	1,100	—	Schiffs. Martin Jansen, Leer
Kohlen-Import & Poseidon, Hamburg	1	Cargo	—	9,500	—	16	Diesel	4,800	—	Lubecker Flenderwerke
Schlussel-Reederei D Oltmann & Co., Bremen	1	Cargo	—	10,000	—	—	Diesel	—	—	Flensburger Schiffsbau-Ges.
German owner	2	Cargo	850 (each)	1,500 (each)	—	—	Diesel	—	—	Howaldtswerke, Kiel
U.S. owner	1	Tanker	—	31,500	—	—	—	—	—	Ch. Navals de La Ciotat
D.S.S Progress, Copenhagen	2	Cargo	1,600 (each)	—	—	—	Diesel	—	—	Svendborg Skibs.
Otto Danielsen, Copenhagen	1	Cargo	300	—	—	—	Diesel	—	—	Svendborg Skibs.
Dampfs.-Ges. Neptun, Bremen	2	Cargo	1,100 (each)	1,700 (each)	—	12	M.A.K. diesel	1,200	—	Schiffbau-Ges. Unterweser, Bremerhaven
Knohr & Burchard Nfl., Hamburg	1	Cargo	—	4,700	328.1 (long)	—	Steam	—	—	Lubecker Masch. Ges.
A/S Kosmos, Sandefjord	1	Tanker	—	34,000	—	—	Diesel	—	—	Gotaverken, Gothenburg
Bruusgaard, Kiosterud & Co., Drammen	2	Cargo	—	2,000 (each)	—	12	Diesel	—	—	Taikoo Dockyard & Eng Co. of Hong Kong

*Additional particulars of a contract previously reported in THE SHIPPING WORLD

LAUNCHES

Yards in Great Britain and Northern Ireland

Date	Shipowners	Ship's Name and/or Yard No.	Type	Approximate Tonnages: Gross	Approximate Tonnages: Deadweight	Dimensions (ft.)	Speed (knots)	Propelling Machinery	Total h.p.	Engine Builders	Shipbuilders
Nov. 15	United Africa Co.	*Aboine* (482)	Tug	38	—	—	—	Diesel	—	—	J. Bolson & Sons
Nov. 27	China Mutual S.N. Co.	*Alcinous*	Cargo	8,300	9,000	487 o.a. - 62 - 35.25	15.5	7-cyl. B. & W. diesel	7,000 7,600	John G. Kincaid	Vickers-Armstrongs, Walker
Nov. 28	Anglo-Saxon	*Fragum*	Bitumen carrier	2,500	3,350	315 b.p. - 46 - 19.5	11	Tr.-exp recip. steam	1,600	Shipbuilders	Smith's Dock
Nov. 29	British Empire S.N. Co.	*Clutha River* (711)	Tanker	12,400	—	—	—	Doxford diesel	—	Shipbuilders	R. & W. Hawthorn, Leslie
Nov. 29	Royal Mail Lines	*Ebro*	Cargo liner	5,170	—	—	—	Doxford diesel	—	Shipbuilders	Harland & Wolff, Govan
Nov. 29	Admiralty	*Eddyboy*	Tanker	2,157	2,095	286 o.a. - 44 - 18.5	12	Tr.-exp. steam	1,750	Lobnitz & Co.	Caledon S.B.
Nov. 29	King Line	*King Malcolm*	Cargo	5,770	9,300	467 o.a. and 435 b.p. - 59 - 37.5	—	6-cyl., 4-str., B. & W. diesel	—	Shipbuilders	Harland & Wolff, Belfast

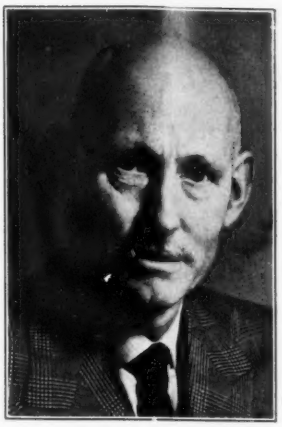
TRIAL TRIPS

Yards in Great Britain and Northern Ireland

Date	Shipowners	Ship's Name and/or Yard No.	Type	Approximate Tonnages: Gross	Approximate Tonnages: Deadweight	Dimensions (ft.)	Speed (knots)	Propelling Machinery	Total h.p.	Engine Builders	Shipbuilders
—	Lloyd Brasileiro	*Alagoas*	Tanker	10,400	16,500	510 - 69.5 - 37.25	14.25	Doxford diesel	5,600	David Rowan	Lithgows
Nov. —	Clan Line	*Clan Macintosh* (665)	Cargo liner	6,600	—	438 b.p. - 60.7 - 26.7	15	6-cyl., 2-str. Doxford diesel	—	Shipbuilders	John Brown
Nov. 26	Admiralty	*Eddybeach* (474)	Tanker	2,150	2,100	286 o.a. - 44 - 18.5	12	Tr.-exp. steam	1,750	Lobnitz & Co.	Caledon S.B.

The Shipbuilding Employers' Federation

At the recent annual general meeting of the Shipbuilding Employers' Federation, Mr. John G. Stephen (*left*) was elected senior vice-president of the Federation, and Mr. Hugh H. Hagan (*right*) was made vice-chairman of the Conference and Works Board of the Federation for the ensuing year. Mr. Stephen, director and yard manager of Alexander Stephen & Sons, Ltd., since 1924, served an apprenticeship with the Ailsa Shipbuilding Co., Ltd., and with Alexander Stephen & Sons. In 1921 he became an assistant manager of Alexander Stephen's. He is also a director of the Africa Lakes Corporation and is president of the Clyde Shipbuilders' Association. Mr. Hagan, a director of Lobnitz & Co., Ltd., since 1946, served his apprenticeship with the Fairfield Shipbuilding & Engineering Co., Ltd., after which he joined Esplen, Son & Swainston, Ltd. He subsequently served as an assistant shipyard manager with William Beardmore & Co., Ltd., and from 1930 to 1934 he was employed as naval architect and assistant general manager of Echevarrieta y Larrinaga, Cadiz. On returning to the United Kingdom he joined Alexander Stephen & Sons, leaving in 1938 to join Lobnitz & Co. as naval architect, afterwards becoming shipyard general manager. He is also a director of the Ailsa Shipbuilding Co., Ltd.



MARITIME NEWS IN BRIEF

From Correspondents at Home and Overseas

THE International Chamber of Shipping, which represents 15 maritime nations, will meet in London on January 16. The last full meeting of the I.C.S. was held in 1950, and in preparation for the forthcoming meeting the Standing Committee, under the chairmanship of Mr. D. A. Delprat (Holland), has met to review current matters relating to shipping and to frame the agenda. The other members of the Standing Committee present were Admiral E. A. Vreede (Holland), Mr. Leif Hoegh (Norway, representing the Scandinavian countries), Mr. R. E. Kumana (India), M. Jacques Marchegay (France), Sir W. Guy Ropner (Great Britain) and Mr. H. E. Gorick (secretary-general).

MR. F. G. HUMPHREY has recently retired from the position of director of information at the Ministry of Transport. Mr. P. W. Darnell, chief Press officer, has also retired. Mr. S. W. Bainbridge, formerly information officer, has been appointed principal information officer, and will be assisted by Mr. K. J. Ley as Press officer. The Information Division of the Ministry of Transport has now become the Information Branch.

REPORTS from Bonn indicate that Western Germany will build fast passenger ships as soon as the restrictions still in force on German shipping are removed. During this financial year, the Bonn Government made available some £8,500,000 to be loaned to West German shipyards. It is now reported that almost the whole of this will be used to launch a programme for the construction of fast liners which will cost about £17,000,000 to complete.

AT A preliminary meeting of the Committee of Lloyd's for 1952, Mr. Matthew W. Drysdale was re-elected chairman of Lloyd's and Mr. Walter Barrie was re-elected deputy-chairman. This will be Mr. Drysdale's fourth successive year of office as chairman of Lloyd's.

THE DEATH has occurred of Mr. Francis Fraser, who was secretary of the British Thomson-Houston Co., Ltd. for 40 years, and had been a director of the company for 27 years when he retired at the end of 1941.

* * * *

THE U.S. Maritime Administration hopes to be able to sell the "Mariner" class cargo vessels it is now building to private U.S. operators, at prices below the cost of construction. Vice-Admiral Cochrane, the Maritime Administrator, in revealing that officials are studying plans to do this, said that he believed there was sufficient power under the Ship Sales Act of 1936 to make such sales. If not, he added, such power could be provided by the long-range shipping legislation now pending in the U.S. House of Representatives after passage by the Senate. The average cost of each "Mariner" ship will be about £3,570,000. The prices at which they would be sold would be based on the cost of building similar ships in foreign yards.

THE Anchor liner *Elysia* arrived at Newport Docks at 11.55 p.m. on November 21, and sailed at 11.30 p.m. next day, after having discharged her Newport cargo of 1,126 tons of steel sheets, which were from New York, to the order of the British Iron & Steel Corporation, Ltd. Discharging operations were commenced with 3 crane gangs on November 22 at 12.20 p.m., and completed at 8.30 p.m. the same day.

SIR GEORGE W. BARR has been appointed chairman of The Liverpool & North Wales Steamship Co., Ltd., for the ensuing year in succession to Mr. H. Ian MacIver, managing director, who becomes deputy chairman. Mr. MacIver had been chairman of the company since 1939. Sir George Barr is managing director of the Fairfield Shipbuilding & Engineering Co., Ltd.

THE DEATH has occurred at the age of 56 of Mr. Robert Stewart, superintending marine engineer of British Railways at Dover and non-exclusive surveyor of Lloyd's Register at the port.

MR. W. S. BATES, secretary of Philip & Son, Ltd., Dartmouth, has been appointed a director. Mr. Bates has been with the company for nearly 26 years.

THE death has occurred of Capt. Sir Ernest H. Thornton, R.D., R.N.R.(retd.), formerly commodore of the Union-Castle Line until his retirement in 1946.

* * * *

THE Cunard Steam-Ship Company's passenger liner *Caronia* will make three dollar-earning cruises from New York during next spring and summer. She will sail from New York about April 26 on a Western Europe spring cruise, following which she will leave New York about June 14 on an 11-day cruise to the West Indies. On June 28 she will sail from New York on a month's cruise to the North Cape similar to that of last year, which was extremely successful. Passengers on both the Western Europe spring cruise and the North Cape cruise may disembark at Havre or Southampton for tours of Britain and the Continent before returning to New York by a later Cunard sailing.

ON November 1, Western Germany had 434 ocean-going ships in service, totalling 871,665 tons. These consisted of 201 dry cargo vessels, totalling 772,094 tons, and 33 tankers, totalling 99,571 tons. These figures indicate that the West German merchant fleet should reach the 1,000,000-tons mark early in 1952.

COL. J. R. H. HUTCHISON has resigned his directorship of Ailsa Shipbuilding Co., Ltd., in consequence of his appointment as Under-Secretary of State for War and Financial Secretary to the War Office.

AFTER circumnavigating the South Pole, the Royal Research Ship *Discovery II* has arrived at Gibraltar, and is expected at Plymouth on December 7 on completion of 18 months' service in Southern waters.

MR. J. F. CADE and Mr. B. F. MacDona have been appointed general managers of Barclays Bank (Dominion, Colonial and Overseas).

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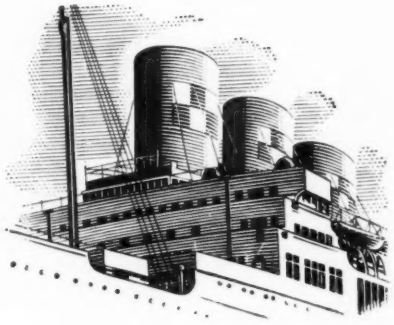

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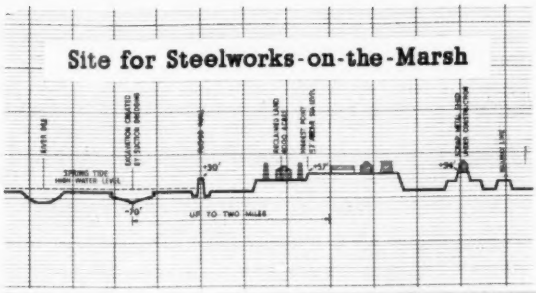

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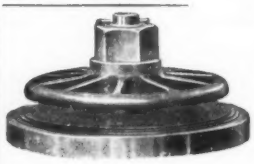

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Published every Wednesday by the Proprietors, The Shipping World Ltd., at Effingham House, Arundel Street, Strand, London, W.C.2, and Printed in Great Britain by the Press at Coombelands Ltd., Addlestone. Agents for Australia and New Zealand: Gordon & Gotch (Asia), Ltd.; for South Africa: Central News Agency, Ltd.; for Canada: Gordon & Gotch (Canada), Ltd.; for U.S.A.: The International News Co. Registered as a Newspaper.